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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

[OFFICIAL NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY,
DELAWARE, O., Nov. 21, 1904.

The Editor of the Wrinkle Department, Mr. E. E. Eysenbach, General Manager of the Binghamton (N. Y.) Gas Company, earnestly solicits the co-operation of the fraternity for contributions to be presented to the Twenty-first Annual Meeting of the Association, which is to be held at the Hotel Schenley, Pittsburg, Pa., March 15th, 16th and 17th, 1905.

Editor Eysenbach will be pleased to receive contributions not later than February 10th. Work for the good of the cause and send him your "Wrinkles."

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Bureau of Information, Ohio Gas Light Association.

CITY OF LINCOLN GAS CO.,
LINCOLN, ILLS., Oct. 10, 1904.

To the Fraternity: At the last meeting of the Ohio Gas Light Association a Bureau of Information was decided upon, the idea of which is to render assistance to members who may have questions coming up or difficultles arising respecting which they would like some help. This Bureau has been established and is now ready for business. A number of co-Editors have been appointed to whom the various questions will be referred. As this is the first Bureau of Information attempted by any Association, it is hoped that the members will take advantage of its opportunities. The co-Editors are as follows:

Distribution.—E. E. Eysenbach and M. E. Malone.

Accounts and Bookkeeping.—D. W. Low and Chas. Ritter.

New Business and Gas Appliances.—Frank D. Moses, Ralph Woodward and F. Cavanagh.

Chemistry.—H. B. Harrop and Clarence Lomax.

Retort House.—Moses Coombs.

Natural Gas.—W. H. Hammon and Geo. W. Barnes.

All questions should be addressed to the Editor, at Lincoln, Ills.

Very truly yours,
H. L. OLDS, Editor Information Bureau.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

OFFICE OF EDITOR WRINKLE DEPARTMENT,
ST. LOUIS, MO., July 25, 1904.

To the Members of the Western Gas Association: We again invite contributions to the Wrinkle Department of the Western Gas Association for the meeting of 1905. The Editor wishes to call the attention of the members of the Western Gas Association, and of the gas fraternity at large, to the fact that the "Western" has done good work in this department in the past; that its Wrinkles have been of value to many, and that it proposes to continue the good work.

The Editor further wishes to suggest that an earnest effort be made to improve the quality of the Wrinkles submitted, as a great many of

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the devices, while of undoubted practical value, are such as any gas works' foreman should know. We desire the Wrinkles which have a greater bearing on the scientific and technical portion of our business. Of course, there will always be room for the little, handy, practical devices, which so often help us over the rough places. We will gladly receive them, but we should all aim to place the gas business on a par with other scientific and engineering enterprises which are practically in a basis of exact knowledge and high efficiency.

To that end, therefore, we desire to secure a large collection of Wrinkles for the 1905 meeting. Give us the benefit of the mathematical, chemical, thermal and other devices which have helped you in designing or improving your plants; do not hesitate to send in the practical devices which are not on record so far; submit the ideas which have made the business end a success; and, finally, let every individual contribute his portion, so that the result may be worthy the achievements of the past, and a credit to the Western Gas Association.

The following wrinkle is submitted as a sample to guide others somewhat in working out their contributions to this department. This describes a method of regulating the pressure on the outlet of a holder in proportion to the rate of sendout, and was contributed by the writer to another Association some time ago.

"The essential idea of street pressure regulation is to maintain a certain pressure at the consumers' meters within a small percentage either way of the fixed pressure. As the consumption increases or decreases, the holder pressure should be raised or lowered. This is usually done by having recording pressure gauges located in the district supplied by the holder, and raising or lowering the holder pressure until the best average for the district is reached.

"Now, it is, of course, true that the same conditions of consumption never obtain on successive days or months, and, therefore, the following automatic indicator was suggested by the writer: In the outlet pipe of the holder we place a Pitot tube facing the holder. Naturally, the opening from the Pitot tube which faces the stream of flowing gas gives the pressure due to the sum of the static head plus the impact or velocity head, whereas the side openings give the pressure due to the static head only. Therefore, any variation in the rate of flow of the gas is at once indicated by the variation in differential pressure from the two openings of the Pitot tube.

"By using a very sensitive differential pressure gauge, we can thus observe this variable rate of flow. It is, of course, necessary to calibrate the instrument for each holder to be able to tell what pressures to carry on the outlet pipe for each division on the sensitive differential gauge, and it would probably be well to check this three or four times during the year. The Laclede Gas Light Company has so far secured three satisfactory types of extremely sensitive differential pressure gauges, and we have arranged them with two scales, one of which shows the divisions in millimeters and the other gives the proper pressures to be carried on the holder outlet opposite the indicator on the gauge. The writer purposely refrains from adding drawings or too much detail to the above description, as he merely wishes to submit one idea, which he hopes will suggest many others to help swell the contributions."

We must start the work at once; therefore, please send your ideas to the Editor, 716 Locust street, St. Louis, Mo., and oblige, Yours truly,

W. A. Baehr, Editor Wrinkle Department.

BRIEFLY TOLD.

Death of Mr. Axel Gutsch.—With great regret we report the death of Mr. Axel Gutsch, who died at his home in San Francisco, Cal., the evening of Monday, the 5th inst. He was a German by birth, and his earliest training fitted him for service in the army of his native land; luckily for him the engineering branch was his division. His service to his country at an end, through the finishing of probationary and set terms, he came to the United States, making his home on the Pacific Coast. There he found occupation as a consulting engineer, and during his consultations, of one sort or another respecting engineering work, he became connected with the gas industry. His first affiliations in that line were sufficiently agreeable to cause him to go on with the industry, and at the time of his death he represented in San Francisco at least two important branches of the mercantile end of the Eastern gas business. He was an active member of the Pacific Coast Gas Association, and those who were associated in direct business lines with him can bear testimony to the firmness of his trading ways and to the lovableness of his personality. For the main facts in this recital we are indebted to Mr. H. M. Hubbard, of the George M. Clark division of the American Stove Company.

Notes——

The Western Gas Construction Company, of Fort Wayne, Ind., has removed its New York City offices from 2015 Park Row Building to 1706 Wall Street Exchange Building, 41 Wall Street.

Mr. William G. Hufty, for 35 years Superintendent of Works of the Camden, N. J., Gas Light Company, and connected with it from its organization, died in Camden the morning of the 6th inst. He was in his 74th year.

[Abstract.—Concluded from page 924.]

PROCEEDINGS, THIRTY-SECOND ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

Held in the New Willard Hotel, Washington, D. C., October 19 to 21, 1904.

Second Day—Second Session.

Owing to the lateness of the hour the reading of the paper by Mr. W. A. Baehr, of St. Louis, Mo., on

DISTRIBUTING POWER THROUGHOUT A GAS WORKS BY MEANS OF ELECTRICITY GENERATED AT A CENTRAL POINT

was ordered taken as read.

[For the text of the Baehr paper see Journal, October 24, 1904, p, 645.]

The President invited

Discussion,

however, on the paper, insisting that the subject was well worth debating.

Mr. J. A. Perry, Philadelphia, said: The first question that presented itself prior to considering the installation of electric machinery in a gas works, was "What saving could be made with steam machinery?" Examining the table of steam consumption he was impressed with the following results:

First; the simple ideal blower engines developed an average of 197-horse power on a steam consumption of 30.5 pounds per horse power hour, which was as good as could be expected. The blowers seemed to be doing no other work than to supply air for the water gas apparatus. This work for 25 inches blast pressure should not exceed 110-horse power. Where, then, did the extra work go? He suggested through leaky blast pipe which could probably be repaired for $500. An 8,000,000-foot plant did not require over 160-horse power at the maximum, so that a 130-horse power automatic cut-off engine was large enough, as it could easily run 25 per cent. overload. On an output of 5,586,000 feet the engines ran on about 58 per cent. load with a steam consumption of 16.5 pounds per 1,000 cubic feet of gas. If developing say 110-horse power, a saving of 9.2 pounds of steam per 1,000 feet of gas could be made, representing $14.39 per day. Three No. 10 blowers, each driven by a 55-horse power De Laval steam turbine, make a very good blowing plant for an 8,000,000-foot works, allowing one blowing outfit for reserve. Two of these units running on 70 per cent. load, for an output of 5,586,000 cubic feet per day, using 33 pounds steam per brake horse power, would require 10.9 pounds steam per 1,000 cubic feet of gas made. That would give a saving per day of $23.29. If the blast were reduced to 18 inches the saving per day would be $27, and at a cost of, say, $7,500.

Second; the water gas exhausters were of such units that a make of 5,586,000, cubic feet was a little larger than the capacity of one of them. By speeding one of the exhausters to a gait of 125 revolutions per minute, instead of 100, the total make could be handled, with a steam consumption of not over 5.1 pounds per 1,000 cubic feet of gas made, and at a saving of $2.66 per day. The engines running the exhausters were about twice the necessary size. Replacing them with engines of, say, 9 by 12, should reduce the steam consumption probably to 4.5 pounds per 1,000 cubic feet of gas made, with a possible saving of $3.58 per day. The cost of the new engines would be saved the first year.

Third; the coal gas exhauster No. 1 is using 12.7 pounds of steam per 1,000 feet of gas pumped, showing a very bad state of repair in either engine or exhauster. A proper engine and exhauster for handling 2,000,000 cubic feet per day should not require over 6 pounds steam per 1,000 cubic feet of gas pumped. Here was a possible saving of $2.51 per day.

Fourth; the No. 2 coal gas exhauster was working as economically as could be expected with so large an engine with so small a load. Replacing the engine with a smaller one, better calculated for the work, a further saving could be made of 24 cents per day. Adding up the savings possible on the blower engines, water gas and coal gas exhausters, amounted to $29.62 per day, or just about the savings for which were required a $110,000, perhaps a $150,000, electric plant. This saving was possible at the comparatively small first cost of $10,000 to $15,000. Estimating the certain savings which could be made, based on work which he had done on this line, an expenditure of not over $4,000 would save $19.80 per day, or about two-thirds of that possible with an electric plant.

Mr. W. A. Baehr, in closing the discussion, said the criticisms showed misunderstanding of the purposes of his paper. Station A, as well as

other stations of the Laclede Gas Light Company, were apt to be abandoned within a few years, and a new, large, modern works built in their stead. He had been asked to write a paper showing what saving could be effected by supplanting the present steam equipment with electric equipment, and that was just what he had done. Because of the high pressure service, gas had to be pumped from Station A very rapidly about 6 o'clock in the afternoon, and for a few hours the water gas sets had to be run at full capacity. Since the holder capacity at that station was small, more water gas exhausters had to be run, all of which explained why the suggestions made by Mr. Perry could not there be followed. In other particulars also Mr. Perry's criticism could be explained if time permitted He wished to add that, as a general rule, if a gas plant was to be continued in existence for some time, he would hesitate to throw out existing apparatus and put in electric drive; but in designing a new, large works he thought no one would question the advisability of installing electric driving apparatus. In the additional installments for capacity, compound, condensing Corliss engines were to be used, also one 300 horse power De Laval steam turbine, acting condensing, and also an electric motor. After having experience with each of them, a comparison of their relative efficiency could be made with certainty.

The President called for the

REPORT FROM COMMITTEE TO AWARD THE BEAL MEDAL,

for the best paper read at the last or Detroit meeting, which report was read as follows by Mr. E. G. Pratt:

WASHINGTON, D. C., Oct. 20th, 1904.

To the American Gas Light Association—Gentlemen: The Committee to whom was referred the award of the Beal Medal for papers presented last year begs to report that it is unanimous in the belief that no award should be made. Respectfully submitted,

GEORGE G. RAMSDELL,
E. G. PRATT,

On motion the report was adopted.

ODDS AND ENDS.

Mr. E. G. Cowdery said, the Committee of Arrangements had shown such exceptional judgment in providing advantageous hotel accommodations for this meeting and such delightful entertainment, that he wished to offer the following:

Resolved, That it is the sense of this assembly that the arrangements for this meeting have been unexcelled, and the Association wishes to extend to the Committee of Arrangements its sincere thanks.

On motion the resolution was unanimously adopted.

Mr. Thomas D. Miller, New Orleans, requested a few minutes attention from the meeting while he presented a matter of great importance to the gas interests of the country. Last September five members of the Association were tendered and accepted appointment as International Jurors at the World's Fair, at St. Louis, and were assigned to Group 49, which came nearest to covering the gas appliances at the Exposition. Group 49 applied to apparatus and appliances for lighting, not electrical; and the jurors were called upon to pass upon Japanese and Chinese lanterns, candles, matches, light diffusing glasses, burners of all descriptions, acetylene gas, coal gas burners and gasoline machines. What aroused their indignation was the fact that an enterprise of the magnitude of the gas business, with the immense amount of money and talent devoted to it in its various departments, should have no separate classification in a great Exposition, such as the World's Fair at St. Louis. He thought this condition was largely due to the gas men themselves and that now was an opportunity to better it. The jurors were so much impressed by the facts that they had made out a series of classifications amendatory of the schedules in existence, which they had asked the Superior Jury to allow and recommend, providing for awards at this Exposition and also for arrangement of any future exposition. A telegram had been received, the day before, saying these recommendations had been passed by the Group Jury, allowed by the Superior Jury, and had finally been presented to the National Commissioners of the Exposition. The National Commission might decline to pass these resolutions on the ground that Congress not having approved the classifications they could not now be granted. Should this prove the case, it was proposed to submit the matter to Congress and have it approved there. Hence it was very desirable for the American Gas Light Association, being at the time in session at the National Capitol, to either give its approval to these recomendations or decline to approve them. Mr. Miller then read the recommendations of the jurors, consisting of Messrs. Doty, Baehr, Morehead, Thwing and Miller, of New Orleans; that awards under the classifications he made at this Exposition so as to make a record for future expositions. He asked the American Gas Light Association to indorse those recommendations.

Several motions were made looking toward indorsing the recommendations of the Jurors. Finally Mr. Cowdery said the situation seemed to need a little clearing up. That the main purpose of passing the resolution was to use it before Congress, for the purpose of registering it as a classification in the gas industry, so that in future expositions this classification will be recognized in making up the classifications of the exhibits. In order to accomplish this it was necessary to have the awards made by the Jurors at this Exposition stand and be made good by the Government.

Upon motion the recommendations offered by Mr. Miller were adopted by the Association.

Mr. Irvin Butterworth said he understood that the Washington Gas Light Company had provided a delightful excursion for the morrow, to which the members of the Association had been invited, and he desired to move a vote of thanks to their Washington friends in appreciation of their hospitality and kind entertainment of the delegates to the Convention.

The motion was seconded and carried.

The President expressed his appreciation of the manner in which the members had attended the meetings, and particularly their promptness, for which he wished to thank them all.

On motion of Mr. George G. Ramsdell the convention took a recess until its return on Friday, Oct. 21st, at which time it adjourned finally.

Discharging and Charging Gas Retorts at One Stroke, as Illustrated by the Fiddes-Aldridge Machine at Pontypridd, Great Britain.

At the request of Mr. J. G. W. Aldridge, 9 Victoria street, Westminster, S.W., London, England, and in our belief that the machine has many meritorious points, we reprint the following concerning it and its operation, the original description of these being contained in the *Journal of Gas Lighting* for October 25th. The illustrations are ours:

Discharging and charging at one stroke! This is the latest development in retort house methods; and it is the minimum of mechanical operation that has yet been devised in dealing with a single horizontal retort from the expelling of the spent charge to the recharging of the retort. That much must be admitted. Inventors have previously got close to the point by the expulsion of a charge by a ram, and the projection into the retort of a fresh charge by a second machine, and by the combination rake and scoop machine, by which the dual operation is performed by one man. Now, with one machine, under the control of one man, the performance of the dual operations in one stroke with through retorts is *un fait accompli*. Not a great many months ago the means of doing this were only delineated in the patent specification of Mr. William Fiddes and Mr. J. G. W. Aldridge, of 9 Victoria street, S.W. From the drawings and specification the rough and unrefined trial machine was produced; and to-day the perfected machine is in practical working at the Treforest Gas Works of the Pontypridd Urban District Council, under the energetic and watchful supervision of the Engineer and Manager, Mr. Edward Jones.

In considering the subject of the discharging and charging of retorts from one side of a bench, it is impossible to overlook the questions of labor economy and of the costs of installation and upkeep of the auxiliary structure and plant necessitated by power machinery; nor can the point be ignored, in making a complete examination into the question, that, if two machines can do the work as efficiently as four, then a very clear case would have to be shown in working economy and results to justify the application of four machines in preference to the two, and if one machine can do the work as efficiently as the two, then, equally, a very clear case would have to be shown, in working economy and results, to justify the application of two machines in preference to the one. But, of course, there are considerations both technical and financial—as to performence and adaptability to a particular situation, and first cost and the expense of maintenance—that have to be closely inquired into. And these are matters that each engineer must investigate in the light of his own particular circumstances. This was what Mr. Jones did; and it led him to determine that the Fiddes-Aldridge electric discharging charger was the power machine that was best suited to his circumstances at Pontypridd. So it has come to pass that Mr. Jones has been the first to practically demonstrate in his daily practice at the Treforest works, that discharging and charging a retort at one stroke is practicable, and

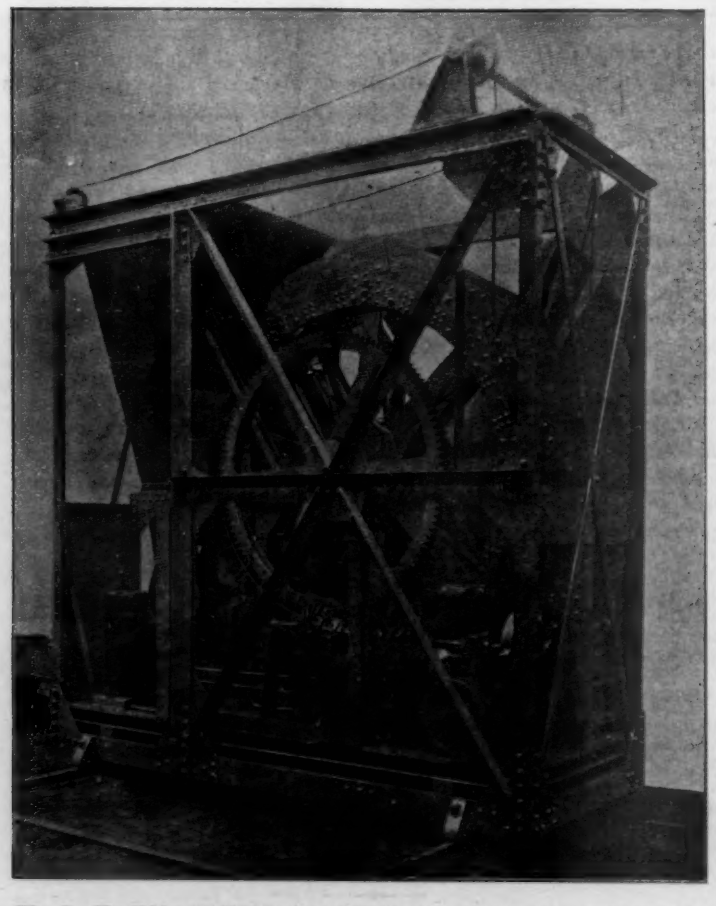


Fig. I.—The Fiddes-Aldridge Machine at Pontypridd. (Photo. taken at the Makers' Works.)

can be accomplished with unfailing certainty under the conditions existing there. This he fully proved, to the point to which he has applied the machine, when the writer had the pleasure of visiting his works last week.

It will not be inappropriate at this stage to pause for a remark or two about the Pontypridd gas supply. It is now 4 years since that Mr. Jones took charge of the engineering and managerial work of the gas department of the District Council; and in that period the business has developed at such a rate that, while in the financial year ending in 1900, the make of gas was 73¼ million cubic feet, and the number of consumers was 968 ordinary and 985 slot, in the last financial year the make was 105 millions, and the number of ordinary consumers was 1,168 and slot 2,083. That is to say, the total number of consumers in 1900 is now exceeded by the slot consumers alone. The total number of consumers of both classes in 1900 was 1,953; and at the close of the last financial year it was 3,251. Under prosperity then present and promising, it was necessary some two years since for the Gas Committee of the Council and their Engineer to look ahead; and Mr. Jones was instructed to report on the question of supplementing the gas producing capacity of the works.

We have read with considerable interest the detailed reports that he then and has since made. He went thoroughly into the question of the various gas making systems which two years ago offered themselves—horizontal retorts with machinery, inclined retorts, carburetted water gas, and capital and working costs, were investigated with scrupulous care. He formed opinions as things then stood, considering also his geographical position in relation to obtaining supplies. As time passed, and the new possibilities of mechanical operation opened up by the new forms of stoking machinery presented themselves, the reports show a conclusive settlement of view in favor of power machinery and expansion of capacity with horizontal retorts. He continued his investigations; and he expresses his indebtedness to several engineers for the valuable information and opportunities they afforded him. In this connection it is better to reproduce Mr. Jones's own words, as they show one of the important points that weighed with him in making his selection. He says: "I carefully considered every machine in the market—from the 'Rapid' manual charging machines to the West and Foulis machines. The former was a relief to the men, without any monetary advantage; while the latter in a works of our size did not justify the investment. The necessity of duplicating the machines and conveying the coal to the opposite side of the house (the coal stores being on one side only) convinced me that our minimum number of retorts could not profitably maintain power machines, and manual machines did not give the advantages looked for, so that the question was shelved for a time. It was not until early this year that I inspected the Fiddes-Aldridge machine, and was so pleased with the working that my Committee decided to put one in."

Having arrived at the point at which the determination was made, the time that has intervened, and what has happened during the period of the machine's probation at the Pontypridd works, need not be dwelt upon. The machine has been at work now for between 2 and 3 months on a few retorts. It almost invariably occurs—it is expected—when putting down a new apparatus or plant for the first time, that an alteration or a little strengthening is required here and there. This has been the experience with the Fiddes-Aldridge machine. It would have been remarkable if it had been otherwise. The principle of the machine—and this is a deserved compliment to the inventors—has not had to be changed one iota since the time that, in its distinctive features, it was designed by Mr. Fiddes, and in its electrical driving arrangements by Mr. Aldridge. All that has been found necessary has been the conversion from cast iron to steel of some of the operating parts; and, since these changes were made, Mr. Jones reports that the machine has been working with delightful ease and constancy—to use his own expression, it has given "unqualified satisfaction" in its working on the two beds of retorts with which it has been dealing, and upon which the retort house men have been practising. It was only on the two beds that the writer saw the machine operate, and it should at once be explained why for a week or two the machine is being limited in its application. It is simply this, that it was rather late in the season when the machine was installed, and the retort power is limited. The retorts, though throughs, were all blocked in the middle, and it has, owing to the pressure of working, only been convenient so far to remove the divisions from the retorts in two beds. But Mr. Jones hopes that, in a fortnight or 3 weeks, he will have the whole of the retorts clear for the machine. The machine is consequently working under some disadvantages, which are not improved by the fact that the arrangements for feeding the coal hopper are only of a temporary and primitive order. But what is a disadvantage for the machine Mr. Jones regards as an advantage for himself and his men, inasmuch as the working on the two beds has enabled all the men, one after the other, to make the acquaintance of the machine, and to learn to handle it thoroughly before putting it into as full use as the house will admit. To obtain proficiency in the handling of the machine is apparently an easy matter, seeing that the operator on the day last week when the working of the machine was witnessed had been in training only two days, and was causing the machine to travel along the floor, the platform to rise and fall to accommodate the machine to the various tiers of retorts, and the discharging charger to glide in and out of the retorts with ease and without hesitation. The personal factor in handling the machine has been reduced to a minimum; so that it is not a matter to marvel over that the men so readily adapt themselves to the machine and become masters of its operation. It should be said for the men at the Treforest works that they have taken a lively interest in what they familiarly call the "Iron Man," and in learning all there is to be known about it.

Leaving the machine for a moment to glance at its surroundings, the house in which it has been installed at Pontypridd has its points of interest. The works at Treforest are the new ones of the District Council; the old works near the middle of the town being now only a gasholder station. The Treforest works are the issue of the scheme that Mr. Thomas Newbigging advised the Council to carry out in 1894–5. The retort house, in which we are concerned for the time being, is built of local stone, and in it the designer emulated the old Romans and built with a view to an endurance through many generations. While the structure is bold and strong, its spaciousness is in correspondence. The house is 115 feet long and 64 feet broad, and its height is such that it is capable of being readily adapted to any system of gas making. It is intended to take 8 beds of 8 horizontal through retorts.

But only 5 beds have so far been erected; and in his extension scheme—now that he is in possession of the Fiddes-Aldridge machine—Mr. Jones contemplates the erection of the remaining 3 beds as early as convenient. However, the house contains 5 beds of 8, or 40 through retorts, and 80 mouthpieces. The retorts are of Ω sections, 22 inches by 16 inches. Down the full length of one side of the house is the coal store, which is 30 feet wide. The coal is brought into the store by an overhead railway in specially constructed wagons, with bottom doors, and sides constructed at such an angle that the discharge of the coal on the floor of the store on the opening of the doors is accomplished with rapidity and certainty. The railway is some 14 feet above the

ground level, and that, too, is about the height of the dwarf partition wall between the stores and the retort house. For the present, and until the scheme is completed after the rush of the winter work, the arrangements for feeding the machine hopper with coal are of the crudest, and yet the most convenient that circumstances would allow. A wooden platform has been carried across the partition wall; and by it the coal supply is barrowed from the railway trucks on the overhead line in the coal store to the machine hopper in the retort house.

Eventually, there will be a continuous hopper with bottom shoots running along the front of the bench, which hopper will be fed from the stores by an elevator and conveyor. Until this is done, and the working is reduced to proper and normal conditions, it is impossible to give positive figures, or even a dependable approximate estimate as to what the ultimate economy will be. But from this brief reference to the house, it will be seen that having coal stores on one side only, there is, in the adoption of a machine dealing with the retorts from one side of the bench only, a perfect sequence of operations—from coal store to hopper, from hopper to machine, from machine into one side of the retort, with ejection from the retort at the farther side. As no one was able to predict in 1895 what would come to pass in 1904, there is a large space to spare on the discharge side of the bench; but this is not a disadvantage from the point of view of the lidsman located on

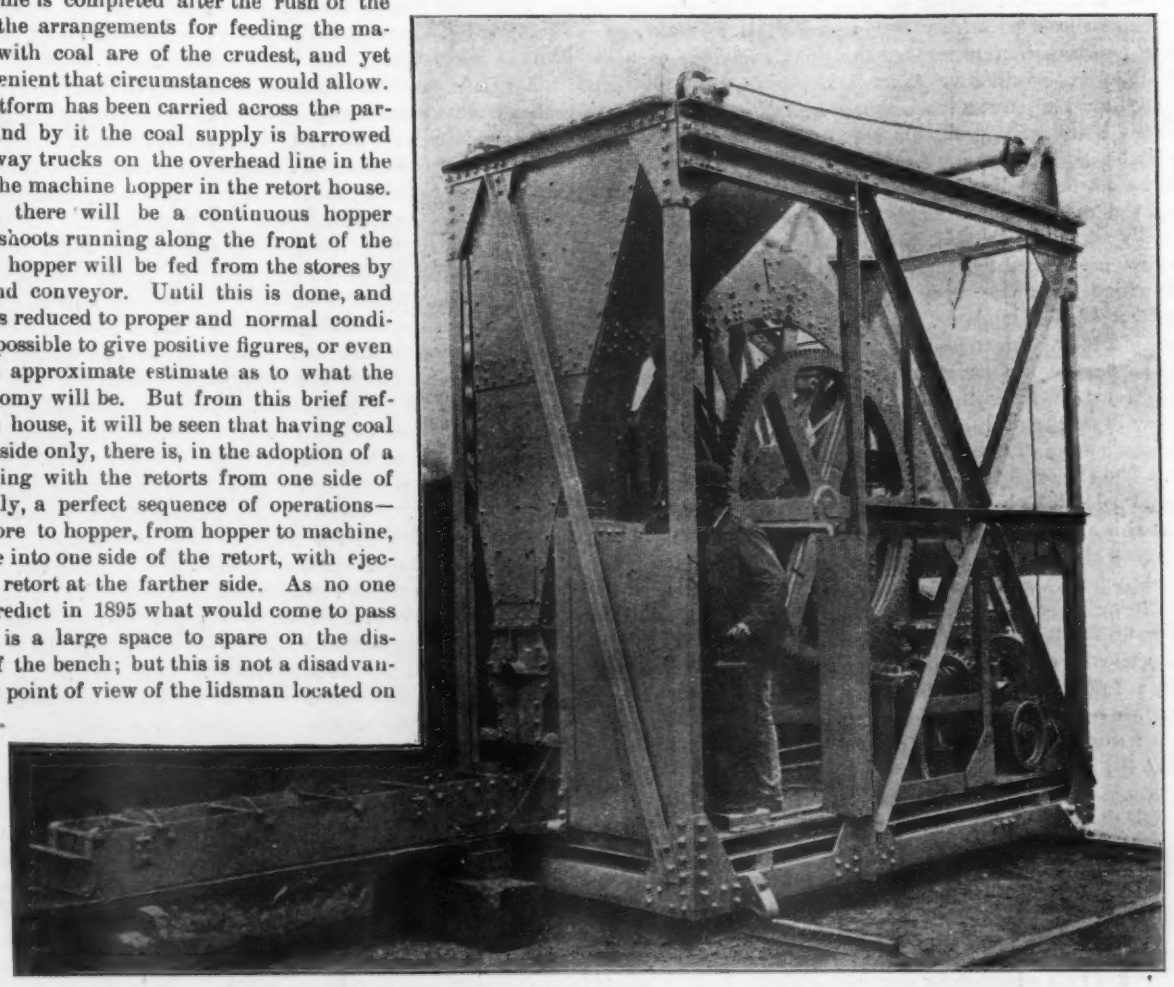


Fig. 2.—The Fiddes-Aldridge Machine—A Good View of the Discharging Charger, Hopper and Feeding Shoot. (Photo. taken at the Makers' Works.)

that side. Here it is proposed to install a coke conveyor. When all the auxiliary plant is in operation, there will be a considerable reduction of time and costs. Under the old order of things, 8 men were required per shift for the retort work; and, for the moment, they continue to be needed, seeing that 3 of the beds are still being hand stoked; but when the machine is in full work, 1 machine man and 2 lidsmen are all that will be needed for drawing and charging. Even when the whole 8 beds (including 3 to be erected) are in use, the 3 men will only have 64 retorts to attend to; whereas it is pretty clear that the machine is capable of discharging and charging (say, to be within the mark) 160 retorts.

It is hardly necessary to describe the machine now working at Pontypridd, seeing that in its construction the specification published in the

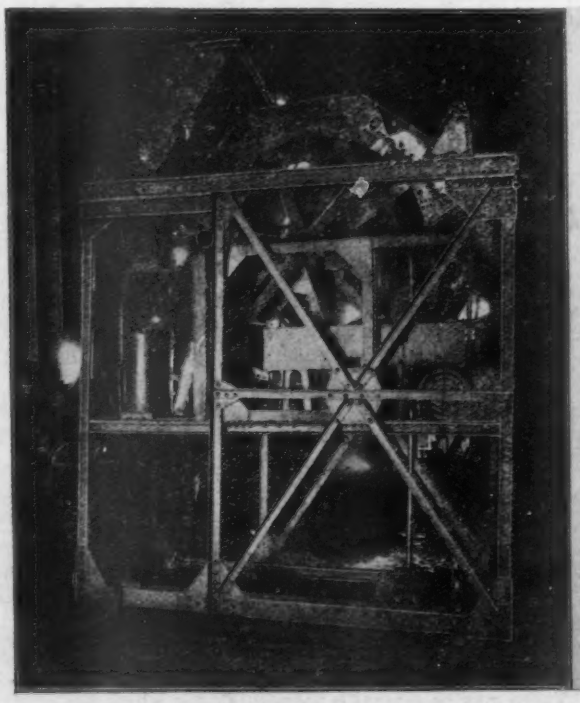


Fig. 3.—The Machine at Work at Pontypridd. (Platform Raised for Discharging and Charging the Top Retorts.)

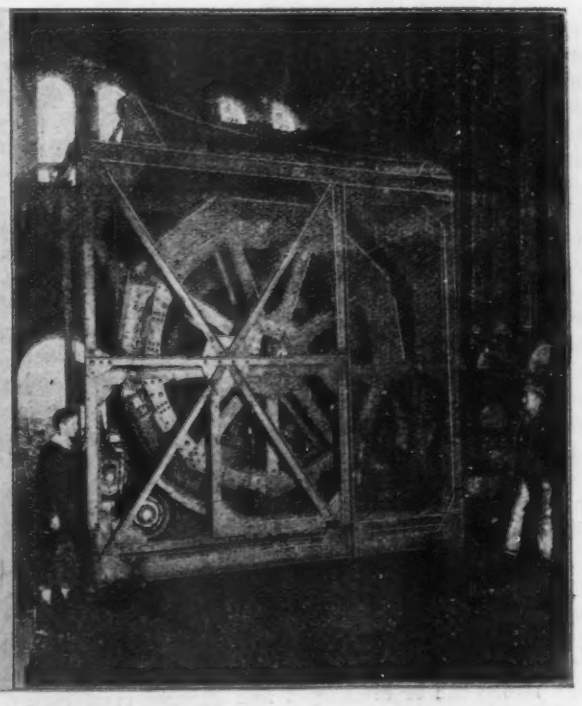


Fig. 4.—Opposite Side of the Machine at Pontypridd. (Ready to Discharge and Charge the Bottom Retorts.)

Journal for Sept. 8, 1903, has been closely adhered to. But perhaps the chief features may be outlined. It will be within the recollection of our readers that Mr Fiddes experimented with a discharging ram as far back as 1894-5. The principal of the ram is the foundation of this machine. What Mr. Fiddes aimed at, and what he in conjunction with Mr. Aldridge has successfully accomplished, is to make, as it were, the ram perform, in one stroke, the dual functions of a discharger and charger, by making it, as it is pushing out the spent charge, carrying into the retort a fresh charge and deposit it there. Of course, where the house will admit, the machine can be simplified by building the discharging charger (or ram) up in one piece. But there are few retort houses that will admit of this; and therefore the form of construction of the machine at Pontypridd is the one that is likely to be most generally adopted. In this, the discharging charger is built in sections, which are hinged together, and are wound on a wheel, the periphery of which comprises nine flat surfaces. The discharging charger is constructed of side plates, with distant pieces between, upon which distance pieces are hinged plates, the purpose of which is to push the charge coal along in the retort, and, on the return, to swing forward, and assist in levelling the top the charge. The discharging charger is, when in use, to all intents and purposes a rigid push plate conveyor, and the bottom of the retort represents the bottom of the conveyor trough. The Pontypridd machins carries a hopper to contain 30 cwt. of coal; and below this hopper is the shoot through the slide door of which the coal is allowed to fall into each section of the discharging charger as it passes along. The machine with its gearing (which need not be described in detail) is mounted on a carriage and a framework of channel iron, strongly braced together. The machine runs on rails laid 10 feet apart in the floor of the house; and embodied in it is a 6-horse power electrically driven motor of the inclosed type, by means of which, and the aid of steel clutch gearing, the traversing, the raising and lowering of each horizontal row of retorts, and the discharging and charging is accomplished. From front to back, the machine frame measures 12 feet 10½ inches; its width is 5 feet 9 inches and the extreme height of the inner frame when serving the top retorts is 16 feet 3 inches. This will show approximately the space occupied. The weight of the machine is 9 tons 2¾ cwt., without coal. Towards the front of the machine, the three switches for the operations of propelling, raising and lowering, and driving the discharger charging are fixed handy for the driver, who has standing room (as shown in one of the photographs) on the machine in such a position that he can see that the operations are all going forward in a satisfactory manner, without being himself exposed to smoke, flame, or steam. The machine is a simple one, and so is the operater's task.

Ultimately, it may be that the electricity supply for driving the machine motor will be obtained from the District Council's electricity works—that is, if they can supply the Gas Department at a price below the cost of rather less than 1d. per unit for which they are themselves generating the electricity required at present. The electricity is generated by a Crossley 14½-brake horse power gas engine, geared to a Crompton bipolar dynamo in the exhauster house some little distance away. The dynamo will give about 10 kilowatts at nominal speed. It has been mentioned that the motor of the machine is rated at 6 horse power; but for discharging and charging only about 3½ horse power is needed. From the generating plant to the retort house, and along its length on the side where the machine is working, the current passes by two overhead bare copper wires, and is conducted to the motor by a sliding contact at the top of the machine. Working intermittently, as at present, it is found that about ½ unit of electricity is expended per bed of 8 through retorts; and it will be borne in mind in considering this what has already been said about the low generating cost. It is, however, the raising and lowering that absorb the greatest amount of power. Four electric lamps are also useed—one over the coal hopper, one on the machine, one over the engine, the other over the dynamo.

There are some odd points which will be interesting before giving a few impressions and observations as to the working of the machine. Local coal, which is not of a high leading grade, is used at Pontypridd; and lest year the average make was about 9,500 cubic feet per ton. The charges are 6 cwt. ones; and formerly their duration was 5 hours 40 minutes—that was, with hand charging. In the beds on which the machine has been working. it is found that 4 hours suffice for thorough carbonization. Asked to explain this, Mr. Jones attributes it partly to the smartness with which the discharging and charging are performed, the short time—not more than two minutes—the lids are open, and partly also to evenness of the charges. From beginning to end, including the traversing and raising and lowering of the machine, it is found that 16 through retorts can be discharged and charged comfortably, even under the present disadvantageous conditions, in half an hour; so that 64 retorts would only monopolize 2 hours. But greater rapidity will be attained when the auxiliary plant hereafter contributes its share to dispatch in the operations.

Now what was on the occasion of the visit the experience with the working of the machine? That is the question about which the reader will be most curious; and the answer can be summed by saying that, under the conditions explained as existing at Pontypridd, it was in every respect most satisfactory. The spent charges were examined: and it was seen they were perfectly flat from end to end, and were, without variation, lying compactly in the retort something after this fashion /‾‾\, which, it seems to us, must rather facilitate the clearing of a retort by this method. As the push plate at the head of the discharging charger came in contact with the spent charge, there was a little breaking up in the center of the latter, and then the whole spent charge began to move—the half at the discharge end retaining perfectly its section until it passed over the mouthpiece and fell to the ground. The retorts were cleared out thoroughly; only a handful or two remaing in the mouthpiece at the discharge end—this being due to the fact that, with the mouthpieces, the retorts are 23 feet long, and the machine was intended for a slightly shorter length. But this, if necessary, could be easily remedied. Throughout, the charge fell away in large lumps; and, when quenched, it was found to be of an exceptionally good size, with very little small in it. This was the unfailing experience as the work proceeded. Returning to the machine side of the bench, it was observed that in the front of the machine was 2 feet 9 inches from the face of mouthpieces, or about 4 feet from the face of bed. When the machine is in position before the retort with which it has to deal, a bed plate is lowered from the machine on to the mouthpiece for the discharging charger to travel over into the retort. Close to the driver's hand are two levers—one for imparting motion to the machine for traversing the house, the other for raising and lowering; while in front of him is the controller worked by a handle on top (which, in future machines is to be replaced by a lever), by which the forward and return motion is given to the discharging charger. Supposing the machine is ready for operation, the man starts it, and at the same time opens, by a hand lever, the slide of the coal shoot. The push plates in the discharging charger are 1 foot 6 inches apart; so that there are two buckets on each flat of the wheel. As the coal drops into these, it rests at the angle of repose from the base of the one plate to the top of the next. Scientific accuracy has been brought to bear in the design. Incidentally, it may be mentioned that in future machines, it is proposed, if desired, to apply means for regulating the feed of coal to any desired quantity; but Mr. Jones says, in his case, he is content to leave this to the man in charge who can see for himself how the "buckets" are filling. A difficulty (but not an insurmountable one) which has been experienced at all events at one works where coal is fed into a machine simultaneously with its discharge into the retort, has been that a little dampness of the coal has caused a clogging in the hopper, and caused the projection of coal to be at times intermittent. Though no difficulty has been experienced at Pontypridd in this regard with the feed to the discharging charger, an automatic agitator has been devised for application where necessary to obviate any such occurrence. However, as each bucket passes under the shoot on its way to the retort it receives its supply of coal. As the discharging charger enters the retort, the spent charge is pushed before it; and direcfly the pusher carrier reaches the farthest length of its travel, it begins its return journey, leaving in the retort the fresh charge. Time tests by the writer at Pontypridd showed that, from the commencement of the outward journey of the discharging charger to its return home again, only 35 to 40 seconds were absorbed—in which time the old charge had been expelled and the new one left in its place. In this way, the retort is never vacant. During the time, too, that the lids were open, there was the minimun of flame and smoke and an entire absence of dust during the conveyance of the charges into the retorts. These are the points that impressed the observer. One other matter that was inquired into was the effect of the heat of the retort on the discharging charger. Of course, carrying in each time a cold charge, tends to keep the plates cool; and though they have been subjected to a severe test, there was not the slightest sign of injury to them, or to the jointing of the plates. Their stay in the retort, too, as has been shown, is very brief. It was further anticipated that there would be a fair amount of rattle in the working of the machine. There was nothing of the kind. The smooth and almost noiseless operation was a matter of pleasant surprise.

This article has been written from experiences and observations at Pontypridd with the working under the conditions obtaining there. There may be several other points upon which gas engineers investigat-

ing the claims of the inventors will desire information; but here we can only write of what has been seen and what could be defitnely learned at Pontypridd. Of this we are confident, that retort discharging and charging at one stroke will receive very serious consideration alongside the well tried qualities of the older competitors. We cannot do otherwise than congratulate the inventors upon the success which has so far attended the first practical application of the machine.

The Mueller Manufacturing Company and Its Trade in Japan.

That the perspicacity of the Japanese merchant leads him to buy in the best market would seem evidenced in the heavy purchsaes recently made in this country for the named Oriental country, especially in respect of gas and water works account. In nearly every instance the specifications for the consignments call for the latest model goods, made

from the best materials and put together by workmen of the superior class. One American firm that has been favored in the securing of a large share of the Japanese trade is the H. Mueller Manufacturing Company, of Decatur, Ills., the goods from which factory are pretty well known to the gas, water and plumbing trade of the United States.

The English International Gas Exhibition.

We are indebted to *Engineering* for the information that the exhibition of appliances in connection with the coal gas industry, organized under the patronage of the English Institution of Gas Engineers, was formally opened Saturday, the 19th ult., at Earl's Court by the Lord Mayor of London. Being the first of its kind for over 20 years, during which time the manufacture and use of gas has made enormous progress, it is impossible to compare it with previous exhibitions, but a very representative collection of apparatus is to be seen on the stands of the 162 exhibitors. The exhibits appear to be solely in connection with coal gas, which is rather remarkable, in view of the great developments recently made in the production of power gas from coke and anthracite, and it greatly detracts from its importance to the general engineer. As is always the case, many of the stands were far from complete on the opening day, though the delinquents were by no means confined to those who had heavy machinery to install; and by some mismanagement the unfortunate exhibitors who wished to show motor driven machinery in operation were prevented from doing so by the impossibility of obtaining a supply of current. At the end of the day the prospects were no brighter, and the strong complaints to be heard were more justified as the normal supply wires of the building were visible, unused, a few feet overhead. We may also mention that although the public were admitted at 11 A.M., no catalogues could be obtained until a very late hour.

Most of the heavy machinery is to be found in the Prince's Hall, immediately opposite the Exhibition entrance in Warwick road. Many types and sizes of gas engines are shown, though there does not appear to be any great novelty among the gas engine exhibits, and many of the leading makers are unrepresented. This last remark applies also to conveying and other gas works plant, several familiar names being absent. The retort house machines on view show that there is a tendency, first, to discard the cumbrous power charging machines in favor of small, light machines which project the coal into the retort at a high velocity; and secondly, to seriously tackle the problem of conveying the hot coke out of the retort house otherwise than by wheeling it away in barrows. The difficulties of conveying hot coke are very great, and it appears to be recognized that the only practical way to deal with it is the rather crude method of dragging it along a trough containing a little water, by means of some sort of endless chain, any more mechanical contrivance being rapidly destroyed by the heat and grit.

Messrs. Graham, Morton & Co., Leeds, have on their stand a very fine sample of coal handling plant, full sized sections of horizontal and inclined conveyors of the push plate, belt, and bucket types being connected up so that the coal passes continuously from one to the other round the plant. A ladder and bridge erected over the plant enables its action to be followed from the best point of view, and the appearance of the whole arrangement justifies the amount of trouble that its installation must have cost.

On the next stand, West's Gas Improvement Company, Miles Platting, Manchester, exhibit full sized details of their hot coke conveyor. The coke falls direct from the retorts on to a heavy endless sprocket chain, the links of which are fitted at intervals with scraper bars extending to the sides of the trough, along the center of which the chain runs. The coke is thus partly carried and partly pushed along the trough. By bending any two adjacent links at right angles the joint pin can be readily withdrawn and the chain uncoupled. The stand also contains a manual charging scoop, arch pipes, mouthpieces, and other gas works appliances.

Messrs. Robert Dempster & Sons, Elland, Yorkshire, have, perhaps, the most complete machinery exhibit in the show. A new charging machine is shown, which is very interesting from a mechanical point of view. It works somewhat on the principle of a gas exhauster, and contains a horizontal cylindrical chamber with a shaft in the center, from which a number of hinged plates radiate to the walls of the cylinder. These plates pass through slots in the circumference of a drum, mounted eccentrically in the cylinder. The drum is driven by gearing from a small electro motor, aud owing to its eccentricity the plates receive a gradually increasing angular velocity as they approach the lower part of the cylinder. The coal is fed in through a shoot at the top, and meets the blades projecting through the drum, when they are at their slowest speed. It is carried round at an ever increasing speed to the bottom of the cylinder, where it escapes tangentially, and is thrown into the retort at the rate of 22 miles an hour. A 20-foot retort can thus receive its full charge of 9 cwt. in 20 seconds. The complementary machine for discharging the retorts contains a telescopic ram which will either push or draw out the coke. The ram is composed of lengths of steel tube of different diameters, and is extended and withdrawn by means of wire ropes passing up the interior. It is worked by a motor mounted on the framing, and can be raised to suit retorts at any level, no pressure being put on the retort at any time by the ram. A hot coke conveyer is also shown, in which scraper bars are dragged along a trough by means of a sprocket chain at either side. The chains are altogether outside the trough, and are amply protected from the coke. The trough is lined with renewable plates. A model of the new "Tipit" bucket conveyer is exhibited. In this conveyor the buckets are semi-cylindrical, and made with overlapping joints, so that its carrying capacity is the greatest possible for its dimensions. The uneven motion of the conveyor, always found when long link chains are driven by sprocket wheels of few teeth, on account of the difference in diameter of the sprocket across the flats and across the corners, is avoided in this case by driving the sprocket through slightly elliptical gear, the varying radii of which neutralize the effect of the sprocket wheels. There is yet another conveyor on the stand, of the overlapping plate type, and a very large collection of other gas works machinery and fittings.

Messrs. W. J. Jenkins & Co., Retford, Notts, are showing the D. B. coal projector for charging retorts, the most striking thing about which is its extreme simplicity. A broad, endless rubber-faced belt travels round 3 small pulleys arranged triangularly, one of which is "live," driven by a 4-horse power motor, and the other two idle. The outer side of the belt, between two of the pulleys, passes round a quarter of the circumference of a large idle pulley, 3 feet 6 inches in diameter, leading on to this pulley vertically downwards, leaving it horizontally, and returning round the small "live" pulley which is slightly in front. The rim of the large pulley carries a D-shaped groove 8 inches wide and 3½ inches deep, so that there is a passage round it beneath the center of the belt. Into this passage the coal drops, is trapped between the belt and the bottom of the groove, carried round the pulley, and hurdled out

horizontally at a very high speed. The coal has a clear jump of 4 feet before entering the retort, which it strikes just inside the mouthpiece, and skids along the bottom, gradually filling the retort to an even depth from the back to the front. As the retort fills the motor is slowed down, the fastest and slowest speeds of the grooved pulley being respectively 230 revolutions and 125 revolutions per minute. A 20-foot retort can be filled from one end in a fraction of the time taken by ram chargers, which weigh about 10 tons as compared with the 18 cwt. of the projector. The machine is hung by four ¾-inch chains from a crab running on overhead rails down the house, and can be completely operated by one man. The machine does equally good work on retorts of either D-shape, oval or round section. The motor is of the inclosed type, and still further protected by an air-tight housing of sheet iron, the starting and regulating handles alone being exposed, and the whole design appears distinctly good. A working model and full sized section of the trough and chain of the De Brouwer hot coke conveyar are exhibited, but this conveyor is now too well known to need detailed description. A massive cannel breaker and a coke breaker with adjustable jaws are shown, and the stand also contains several Capell fans of various sizes.

In the Ducal Hall most of the gas stove exhibits are to be found. Messer. T. Glover and R. and A. Main, Limited, of Edmonton, show a great nnmber of cooking and heating stoves, dry meters, of the ordinary and prepayment types, and specimens of the Gothic 2-cycle valveless gas engine. We hope to publish particulars of this engine shortly. It is impossible to deal in this article with the vast array of stoves, meters and illuminating apparatus in this and other buildings, but all the leading manufacturers make a very fine display, their productions, in fact, forming the bulk of the whole exhibition. To return to the exhibits of more engineering interest, the Stavely Coal and Iron Company, Chesterfield, show two built up semi-circular sections of tunnel rings, 30 feet in diameter, completely spanning their stand. Some large pipe castings are shown, three of which are respectively 60 inches, 45 inches, and 42 inches in diameter, and 12 feet long. They have been cast vertically, and are wonderfully true and clean.

The Thames Iron Works, Canning Town, E., show large tooth grabs for unloading coal from barges, and discharging into hoppers. A spoon grab for denser materials is also exhibited, and a 4-bladed excavator for well sinking.

Messers. Gibbons Brothers, Dudley, also have a very large stand, mostly devoted to fireclay goods, such as retorts, firebricks, etc. Many models and drawings of different settings for various numbers of retorts are on view, and a special section of the stand is set apart for retort house fittings, bench and constructional ironwork, etc. Elevators and conveyors are shown in motion; and all details of such machinery, as well as spur wheels, pulleys, brackets and gearing, are shown separately.

The Temperley Transporter Company have a very fine model of a travelling tower transporter in operation, show ing the ease and rapidity with which materials can be handled by this means. The Simms Manufacturing Company, Willesdenlane, Kilburn, N. W., show a large number of air and water cooled motors, from 2¼ to 30-horse power, fitted with the Simms-Bosch magneto ignition and mechanically controlled inlet valves.

Messrs. Bryan Donkin and Clench, Chesterfield, show a large and small exhauster driven by steam and gas engines respectively, and also a compound gas compressor for long distance transmission of gas, driven by a Stockport gas engine. There is also on the stand a Mahler-Donkin bomb calorimeter for determining the heat value of solid or liquid fuel. A gramme of the fuel to be tested is placed in a crucible, which is enclosed in the bomb, and the latter then filled with oxygen at a pressure of 25 atmospheres. The bomb, which is gold plated internally to prevent corrosion, is then placed in the water vessel or calorimeter proper, and the fuel fired electrically.

Paddles for stirring the water are provided, and from the rise of temperature of the water the heating value of the fuel is directly calculated. There is an outer water jacket separated by an air space from the calorimeter, which prevents heat transference to or from external bodies. The results obtained by this calorimeter are stated to be within 0.3 per cent. of the true value calculated from chemical considerations, and the instrument on view has been purchased on behalf of the National Physical Laboratory.

We regret to report the death of Mr. James Vanderzee Brown, formerly President of the Williamsport (Pa.) Water Company, and at one time largely interested in the gas supply of that city, who died at his home in Williamsport, the morning of the 8th inst. He was in his 78th year.

The Coming of the Gas Turbine.

[By Mr. E Kilburn Scott, A.M.I.C.E., M.I.E.E., in *Elec. Review*, London.]

It is not generally known that, some five or six years ago, experiments were being made in Leeds with a gas turbine. The machine was modified from a De Laval, and was actually made to run. Certainly, it did not run very long, and nothing much has been heard of it, but this is partly attributable to the limited resources of those engaged in the work.

Since then, the rapid development of steam turbines and large gas engines has shown that the days of the reciprocating steam engine are numbered, and this is, naturally, having the effect of causing steam engineers to look around for a new prime mover, and some in this country are already at work on the gas turbine.

One of the more significant facts which came to the writer's knowledge during a recent visit to the United States, was that both the large electrical concerns (at Schenectady and Pittsburg) were experimenting with gas turbines. It is only within recent years that either of these firms, or, indeed, any one in America, has seriously considered turbines, but when they took hold of the steam engine, they lost no time in developing it, with the result that one has now to go there to see the latest and largest practice. It is all the more interesting, therefore, to find them at work on the gas turbine problem.

The paper read recently before the Institution of Mechanical Engineers by Mr. R. M. Neilson, on the possibilities of gas turbines, comes at a very opportune time, and it is an especially valuable contribution, because the author carefully points out the theoretical principles which investigators must bear in mind. He shows that when working on Carnot's cycle, between 1,600° and 17° C., the greatest possible efficiency is:

$$\frac{T_1 - T}{T_1} = \frac{(1{,}600 + 273) - (17 \times 273)}{1{,}600 + 273}$$

= 85 per cent; while a reciprocating gas engine working on the Otto cycle with compression to 60 pounds per square inch, combustion at constant volume, and expansion to atmospheric pressure, gives at most only 37 per cent. An important point to note is that it is relatively more important to have the lower temperature low than to have the higher temperature high. Thus an ideal gas engine working on Carnot's cycle between the limits of temperature, 2,000° C. and 300° C. absolute, will lose as much by an increase of 100° C. on the lower temperature as it will by a decrease of 500° C. from the higher temperature. This is good, because it is clearly much easier to build a turbine for a low temperature than for a high one; indeed, it is doubtful whether turbines can be water-jacketed effectively to withstand an initial temperature of 2,000° C.

Of course, in any form of motor using gas, a large amount of heat must necessarily be lost in the water, and the higher the initial temperature the greater will this amount be. It has been suggested to utilize this heat by raising the water to boiling point and then passing the steam along with the gas through the turbine, but clearly a better way would be to utilize the steam in the gas produeer and thus dispense with separate boilers.

One of the principal difficulties which has to be met in the turbine design is to fully utilize the full velocity of the steam or gas. Thus saturated steam at 300 pounds absolute, expanded adiabatically from a De Laval nozzle, has a velocity of over 4,000 feet per second, and with gas the velocities which will have to be dealt with are likely to be still higher. Now, such velocities as these are far greater than the peripheral speed at which metallic bodies can be run.

The difficulty has been very fairly met in the Curtis, and to some extent in the Westinghouse steam turbines for Chelsea, by arranging the expansion in stages and combining the De Laval nozzles with Parsons' vanes. It is probable a construction such as this will meet the conditions of the gas turbine.

One advantage which gas has over steam in a turbine, is that there cannot be any water present with the former, and therefore liability to cut the blades as well as friction in the nozzles, etc., is reduced.

It is, however, not so much the steam turbine as the gas engine, that the gas turbine will eventually have to reckon with. The usefulness of steam machinery is limited by the wasteful method of burning coal on a fire grate, and also because steam boiler units cannot be built much larger than 1,000-horse power. Therefore, however much the steam turbine itself may be perfected, it will always be handicapped by the boiler side of the proposition.

In order to more fully understand the chances of the gas turbine as the coming prime mover, it may be interesting for a moment to draw some comparisons between the gas engine and the gas turbine:

(a) It is clear that one great advantage of working with gas, is that in a turbine it can have practically a continuous flow, whereas in the engine it must be cut off at every working stroke—usually one in four—with a liability to back firing, which is absent in the turbine.

(b) The turbine is able to do its own scavenging automatically, by the mere fact of the gas entering at one end, and the products of combustion leaving at the other. With an engine the charge may be, and generally is, compressed in the cylinder, but in a turbine it must be compressed separately. This can be affected in a simple manner by the turbine rotary pump, which has been developed with such success in connection with colliery ventilation, etc.

(c) Perhaps the greatest difference between the gas engine and turbine is that in the engine the metal surface with which the gas comes in contact, is small compared with a gas turbine, especially if multiple expansion is attempted, because almost every particle of gas must necessarily slide along a metal surface as it passes through the vanes. Fortunately, however, the rotating and fixed portions do not come into intimate contact as is the case with the piston and cylinder of an engine, and, therefore, the metal surfaces may be worked at a much higher temperature.

(d) As with engines, so gas turbines will require to be water jacketed, the extent of such jacketing depending upon the method of working. For example, if the temerature is below 1,000° C., it is probable that jacketing the outer casing may meet the requirements. For 2,000° C., however, it will be neccessary to have water circulating through the spindle, and the rotating rings and blades. At first sight this may be thought somewhat difficult, but after all it is much less of a mechanical problem than providing a water supply in the piston of a large gas engine, which latter is necessary to prevent back-firing.

(e) Regarding the governing, there is on the face of it a distinct advantage in favor of the turbine, because of its not having any dead center, and the regulation can be so simply affected by shutting off more or less nozzles as in the Curtis steam turbines. The gas engine, on the other hand, requires a heavy flywheel, and if economy of gas is aimed at by using the hit-and-miss form of governor, then the flywheel becomes exceedingly heavy.

So far as actual construction is concerned, the main difficulties experienced up to now have been the soothing up of the nozzles and other working parts, and the shrieking noise, the latter being perhaps the more formidable of ihe two. The Hon. C. A Parsons, C.B., had a much tougher job before him when he developed the original steam turbine, for the modern investigator has a mass of facts to work from, and he is also at an advantage in having better and stronger materials, and much more accurate machine tools at hand. A large number of the details must be the same as for a steam turbine, and the elaborate gas engine trials of recent years are available for the investigator.

The Outlook for Engineering Education.

Mr. C. F. Allen, Professor of Railroad Engineering in that sterling school, known as the Massachusetts Institute of Technology, in the course of his address as President of the Society for the Promotion of Engineering Education, read last September at the meeting held in the World's Fair, St. Louis, said:

Organized, as we are, to study problems of engineering education, it is proper for us to inquire what is to be in the future the special nature of the demand for men educated in engineering; and what we must do to meet the demand successfully.

It can be assumed without question that in the future as in the recent past, for positions directly as in engineering, the graduate of the engineering college will in general be demanded, and that even more than in the past positions of prominence, the prizes in the engineering field will mainly go to the school-trained men, and an untrained man will have little place in engineering. Recently the demand for engineering graduates has been sufficent to absorb the whole output from the colleges of engineering. A year ago the evident demand was perhaps double the apparent supply. During the year past the demand appeared to abruptly drop, but there has been a notable revival; to-day it may be, temporarily at least slightly inferior to the supply.

Employment in engineering has generally but not always proved the goal for the graduate. In many cases it has rather been the channel, the period of preparation or probation for duties of a somewhat different character. In an increasing degree it has been found advantageous and desirable to secure superintendents, managers, presidents of railroads and other semi-engineering enterprises by promotions from among the school trained engineers. The policy of that splendid railroad system, the Pennsylvania, has long since been established; the civil engineer engaged upon maintenance of way finds himself directly in line of office of the Division Superintendent, to whom in turn the office of General Manager or even of President is in line and an evident possibility. A large number of mechanical engineering graduates are now entering upon railroad work; indeed, in many instances in the past they have been selected to occupy the highest operating positions; there seems no reason why the prizes in future should not be fairly or evenly divided between the mechanical and civil engineers, while the rapidly increasing importance of electrical propulsion, and of electricity in signal work and otherwise will shortly demand a knowledge electricity which will give to the electrical engineer an importance in general railroad work sufficent to introduce a new element of competition which the civil and mechanical graduates must face. To my notion, a legitimate field for engineers is the occupation of all executive positions where engineering knowledge and skill are of immediate value, although the work is not immediately and directly the practise of engineering. I hope and expect to see this field constantly enlarging for the engineer and I desire that the engineer shall consider that the dignity of the profession does not suffer by his acceptance of such posts of honor and usefulness.

Another field open to men trained as engineers is that of contract work in engineering construction. To some this has seemed, in civil engineering at least, as a lowering of dignity. A somewhat broader view appears to be that methods of executing work are often more important as features of engineering than is the ultimane design. Furthermore, if the school trained engineer contractor does bring to his work greater skill in execution, greater pride in honesty of construction, and a better analyatic understanding of the cost of various elements in the work, with diminution of the risk, and a consequent lowering of the cost (as I believe he does) then the contractor is not and ought not to be as sometimes in the past, in any sense a constitutional foe of the engineer in charge, but rather a help, or better, an engineer legitimately in the practice of a special branch of enigneering which ought properly to attract those whose abilities and tastes lead them towards it. In bridge work, machine shops, electrical manufacturing and installation, and many kinds of engineering it has long been true that the standing of the contractor has been inferior on the whole to no other class of engineer.

New fields for men trained as engineers are opening daily. Looking backward for 35 years, it appears to be true that the opportunity for employment for the large numbers graduated now, is definitely better than for the limited numbers of graduates at that early time. It is my judgment that the demand for engineers that comes from the development of engineering enterprises is due in very considerable part to the fact that there has been available in increasing quantities a supply of competent engineers, and this in turn to the fact that in this country the opportunities for engineering education have been more general and its quality better than in the earlier days.

In many instances individuals have largely or entirely created their own opportunities, and have often incidentally enlarged the general field of engineering opportunity and employment, so that the increased general demand has in many instances been due specially to the superior quality of the supply as shown by some individual engineer. The city engineer of a small city in Massachusetts failed to secure reappointment when a change of administration was made. He had given careful study to road construction, which was then receiving much attention, and at some apparent sacrafice at first, he continued to give special attention to this class of work, in which he attained acknowledged prominence. His influence was important in securing the appointment of the Massachusetts Highway Commission (of which he has always been the most active member and is now Chairman), which has constructed about 575 miles of State highways, with an expenditure by the Commission of more than $4,500,000, besides aiding largely in the impetus given to highway construction the country over. The engineer largely created his own opportunity—the supply created the demand in his case.

Two of the most important engineering projects in Massachusetts, the Metropolitan Water Supply and the Charles River Basin, are the results of careful work and able reports by an engineer who was recognized as an able investigator, but who appeared to be shelved from active construction in his position of chief engineer of the State Board of Health. The expenditure upon these two projects will be about $28,000,000 and the engineer in question is either chief or consulting engineer of both schemes. The general opening of opportunities for many other engineers which has been created by these works has been of great importance to engineering. Instances of the man creating his opportunities could be multiplied indefinitely.

The field chosen by the individual for his opportunity is not always pure engineering. While the demand for engineering and the demand from engineering enterprises, the demand for engineering graduates, the demand for engineering education is strongly on the increase, yet the day of trouble is before us, the day of financial crisis, when enterprises languish, when the demand falls sharply off, and the supply continues, although in diminished numbers. Then will come the time when the practicing engineer and the engineering graduate will find a necessity, not now existing largely, to make for himself his opportunity which will lie outside the established lines of engineering; when he must accept not what he would but what may be offered, and the engineering graduate will be forced into general business, into manufacturing. It seems reasonable that his greatest usefulness will first be found with dealers in engineering or mechanical supplies, or in manufacturing where engineering skill can never be amiss; already the demand in these directions has become a reality, rather than a possibility. Already some of the manufacturers' insurance companies employ a large force of men trained in engineering. Life, fire and marine insurance constitute, likewise, reasonable fields. Banking, and the sale of stocks and bonds, are occupations to which in many instances engineering graduates have already found themselves adapted by the training they have received and in which the line of study followed in the engineering college has been found frequently to be of practical advantage.

For the purposes of general business of various classes, if more than the high school course is to be attempted, what is there better for preparation than what a young man receives in our engineering colleges, as the courses are now arranged? There is recently much unanimity of feeling among our foremost educators that education should have as its object "training for power" as the expression is. Nothing in education is more important than that the student should be forced to think. The man who has experienced religion in a twinkling has no more surely caught a glimpse of a new world and a new life than the dull student who finally exclaimed to me, his tutor in a mathematical subject, "I see, you want me to use my good sense, and not my memory." He had seen the light; he was a dull student no longer, nor was I longer his tutor. Isn't it true that the old classical courses in our colleges, with history and language predominant, tend to train the memory far beyond all else; and that the engineering courses, with mathematics and science predominant, tend to compel thought? Do the academic courses in our colleges differ sufficiently from the classical courses in this feature to be free from the same criticism? A man becomes strong by virtue of the work he does, the exercise he takes; one measure, often a good one, of the efficiency of instruction, is the amount of work demanded from the student; a good measure of bad teaching is the amount of work assumed by the teacher which should fall upon the scholar. Without taking the above proposition literally, it is well known to those familiar with the facts, that the student in the engineering course works much harder than his neighbor in the same college who has selected the academic course. Which student is securing the greater strength?

The study of mathematics in lines advanced beyond the high school scope must certainly be of value to the man who desires to have a grasp in matters of accounting and finance. The study of science trains him to observe facts and phenomena and to draw correct inference and conclusions from such facts; business procedure, also, should be founded on a knowledge of underlying facts, and the successful business man should be he who successfully interprets these facts.

To my mind it is also true that the information acquired in the engineering course is likely to prove of value to the business man, although we all understand that this is not the important feature of the education. A knowledge of chemistry, of physics, of the properties and laws which determine the behavior of materials, a proper understanding of the nature and laws applying to the use of steam, electricity and water wheels, or in other words an understanding of power and its use; these at least constitute a resource for understanding and handling things material and mechanical, which ought to be of value to any business man, and especially to those whose business has intimate connection in any way with manufacturing. To the scientific studies are added, at least in very many of our engineering colleges, courses in history and economics, some familiarity with French and German, and in reasonable amount the study of clear expression in English. Isn't it true that this training is strong in securing habits of application, strong in training the proper qualities of the mind, strong in the useful knowledge of facts and principles acquired?

But beyond all this the moral training, the training in character which is a natural result of an intimate acquaintance with science, of close contact with scientific methods of reasoning. The study of science is, it must be, the search for truth, and it must from usage cultivate a love for truth. That the scientific attitude of mind is of supreme importance as an element of character building seems to me on principle to admit of no doubt. As a matter of observation, I know of no class of men whom I believe to be less subject to business corruption than the civil engineers who have come more especially under my notice, and I do not doubt that the school trained mechanical, electrical and mining engineers are men of equally high character.

The influence of training in mathematics and science is also calculated, it seems to me, to develop another important element of character. The student learns in mathematics that correct procedure will secure correct results; in science correct observation and proper reasoning again will secure correct results. A clear appreciation of these truths naturally leads to the establishment of that quality of character which we call courage. An engineer unless he is trained so as to have acquired something of courage is comparatively valueless. A very able editor in the engineering field once stated that an important value of engineering education is that it enabled one to look a fact in the face. It sometimes takes courage to do that. To me it seems most important that any business man should have learned courageously to look facts in the face; if the facts show not only present but also future losses as the result of continuance of a given policy or even of a given enterprise, the sooner the truth is known the better. Not all business men are proof against self-deception.

There remains untouched the question of executive ability, about which there seems to be much confusion of mind. That the engineering graduate by virtue of his years of study has had his executive capacity impaired, I am unwilling to believe. The numerous successful executives who have come from this class is an assurance otherwise. To the contrary it has always seemed to me that executive ability consists in important part in a knowledge and appreciation by any one of the things to be done, by others to be sure, under him. If a man by virtue of his education does have a proper appreciation of the behavior of materials, of the nature and use of power, of natural law, to my mind one of the requisites for executive ability has been largely secured.

From another point of view, it has seemed to me that the man educated as an engineer must have acquired, to be successful, the habit of investigating conditions and materials, and of devising methods of construction or operation dependent upon these conditions and materials. To the man trained in this way, the study of materials then becomes in part the study of men—the men with whom he has to deal or the men upon whom he depends, and his training has done much to secure a second qualification for executive ability.

That the great places are filled by men of inborn executive genius is no doubt true, but the geniuses are few and the positions are many, and these positions must be filled by men in whom, of course, the executive quality must not be definitely lacking, but men of good parts whose training and experience qualify them otherwise to successfully fill them, and I believe that this means the men with the engineering training in which science and mathematics play a leading part. That the ordinary academic college training will generally serve the same purpose I see no reason to believe.

In my judgment, not only is it true that graduates of engineering courses will find it necessary to enter into the field of general business, but I believe that their success will be sufficient so that this necessity will be most fortunate for the cause of which we are all interested in as engineering education. With the increased activity which will follow, broader fields will open out, and other important outlets for our graduates will be recognized and accepted. In the Boston public schools, college graduates only are eligible to the desirable positions for men. These men are now mostly graduates from the academic courses and as a rule highly trained in the classics rather than in science and mathematics. Large numbers of young men enter college well knowing that their first employment after graduation must be in teaching; many never leave this field. At present very few of the graduates of an engineering college are content to teach, unless in professioual subjects in technical colleges and comparatively few, even then. When the time of stress arrives, teaching, as well as general business, will prove attractive and engineering education will reap a benefit from having the work of preparation in the hands of teachers interested in engineering, and trained most effectively in science and mathematics. The "Head Master" of a grammer school or the "Master" of a high school in some of our large cities receives a salary not inferior to that received by the majority of the faculty of most of our colleges, academic or engineering; the position is practically permanent, the opportunity for usefulness great, and the dignity sufficient so that many of our gradu-

ates might well look to teaching, provided their tastes and capacities indicated that as a proper vocation.

With the growing importance in the world of matters engineering and mechanical, there must also be a demand, constantly increasing, for journalistic work, not only for technical periodicals, but for newspapers and general publications. Not only on the side of an appreciation of the technical or engineering application of many matters of interest to the public, but also upon the literary side, there ts no reason why engineering graduates should be at a disadvantage. If the engineering training tends to clear thinking, as we believe it does, it ought also to tend to clear writing. A clear view of an idea to be expressed is the first requisite to clear expression. The engineering training tends strongly to secure not only clearness, but it seems to me simplicity of style, and if these be secured, little else need be desired.

If the field of employment for graduates in engineering is to be in effect what has been set forth above, what shall be the character of the college of engineering in the futurel For the present, at least, the college of engineering as now commonly organized for undergraduate work seems to be very efficient and to reasonably meet the demands and requirements of the engineering profession. Will it continue to do undergraduate work or will it become peculiarly a professional school, and open only to graduates of colleges (academic or engineering) at that? In my view, the great demand will be permanently for the engineering college doing undergraduate work; whether as a preparation for engineering proper, for semi-engineering or non-engineering executives in the conduct of large enterprises, for positions in general business life, or for the work of teaching. That there will be a moderate (but perhaps a limited) demand for engineers trained well beyond what is possible in a 4-year undergraduate course, is to me a proposition whose truth cannot be questioned, but that the great body of engineering graduates should be as highly trained admits of serious doubt.

Whenever the demands require men trained farther and higher for the more important positions, how shall the work be done? In purely professional schools open only to college graduates? Possibly, but if so, for the best development, then the graduates must be men well trained in science and mathematics—trained very much as we now train the men in our undergraduate engineering courses. The logical outcome appears to be, not the professional engineering school or college, but rather a development of graduate work, the granting of the advanced degree, with the advantage not only of building upon a foundation sound and sure, but also of attracting and developing mainly those men whose demonstrated ability shall have established a probability of worthiness sufficient to secure the advanced degree, the survival of the fittest. Not only does this seem the logical development, but in this country also it is the actual developmet and it is taking place in several of the foremost schools of engineering.

That the undergraduate engineering courses in our colleges are destined soon to outstrip in numbers the academic, I do not entertain a doubt.

Indications are not lacking that, taking the country as a whole, that result may have been already accomplished. That the engineering courses furnish a superior training is my firm conviction. The field is or is to be ours and with it increasing responsibilities, increasing dangers, against which we must guard.

The Electrolytic Meter.

By R. S. White.

The mention of the electrolytic meter is likely to bring up the obsolete types of the early days of electric lighting in the minds of those who have not followed the remarkable development that has been made in this branch in recent years. This development has led to types of electrolytic meters which have little in common with the crude early types, from which they differ in the method of application of the electrolytic principle and most radically in form. In Europe, where most of the work on the modern electrolytic meter has been done, this type during recent years has succeeded in replacing the motor meter on many central station circuits.

Perhaps the most simple type of the modern electrolytic meter is the Bastian meter, which is particularly well known in England, where it has been in commercial use for some years. In this meter the electric current decomposes the water of an electrolytic solution, the level of which is gradually lowered in strict proportion to the amount of current which passes. In the old style of instrument, the electrolytic consisted of a very dilute solution of sulphuric acid and water to which was added a non-freezing mixture. Platinum electrodes were used with this solution, requiring vulcanite tubes for support and protection.

In the further development of the meter, it was found that with pure nickel electrodes immersed in an alkaline solution, the vulcanite box and tubes were no longer necessary, and a simpler and stronger construction was permitted. Besides this, the new alkaline solution was found to be practically non-freezing, and the nickel electrodes being much larger, reduced the resistance of the cell, the "drop" becoming about that necessary for the decomposition of water, or a little less than 2 volts.

The electrolyte changes in resistance somewhat according to its density, but as no shunt is required in the meter, and as all the current passes through the solution, there is no resulting error.

This electrolytic meter is quite accurate at all points of the curve, and no current, however small, can hope to escape registration, a point of considerable importance where a large number of small consumers is concerned.

Vibration does not effect the electrolytic meter, but it is a cause of disturbance and error in the commutator motor meter. For it soon results in more or less injury to the jewel and pivot bearing, with a consequent loss of accuracy on light loads. If not discovered and a new jewel or pivot supplied, an increasing loss on all loads is sure to follow.

Vibration may also increase the sparking effect on the commutator and brushes, roughening the contact surfaces appreciably and tending to slow the meter.

Heavy overloads are well borne by both meters, if we except short circuits, the magnetic shock of which is usually detrimental to the magnets of the motor meter. Motor meters, too, should be installed in a level position, as any deviation causes a loss of sensitiveness to small currents. Dust and dirt where abundant sometimes gather on the commutator and brushes, increasing the friction and introducing small losses until remedied by the inspector.

Then again, the use of the starting coil in the commutator type of motor meter sometimes introduces troublesome errors, especially if the potential of the circuit varies to any extent. However carefully adjusted this coil may be for the standard potential, any considerable increase will cause the meter to "creep," *i. e.*, to register when no current is being used. Or, if the coil is not well adjusted, the meter will be "sluggish" on small loads, when the potential is low.

The Bastian electrolytic meter requires to be periodically filled with water, but as one filling usually lasts from 4 to 6 months, this simple operation can hardly be compared to the careful testing and readjusting necessary to keep the commutator meter in efficient condition.

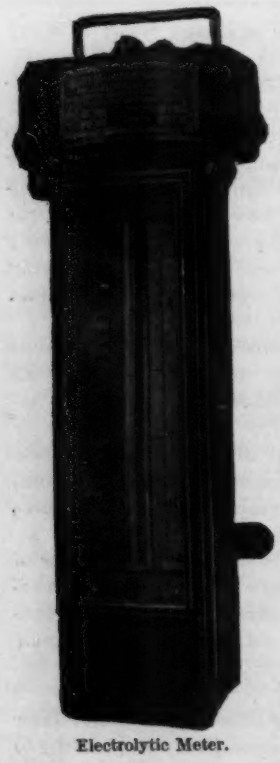
With a meter plainly indicating its record on a straight line scale, disputes will not so easily arise between consumer and producer. For it is well known that few persons can read the ordinary motor meter dial correctly, even with considerable explanation.

In 3-wire service, two recording elements inclosed in a single case are employed, one being connected to each of the outer mains. This arrangement shows the consumption on each side of the circuit, and in case of trouble is also quite advantageous, as the registration of this meter is not disturbed by the reversal of the current. With the 3-wire motor meter, however, when the supply is locally changed over from a 3-wire to a 2-wire connection, the value of the record is destroyed, and troubles with the customer are more likely to follow.

The use of glass outside of the window for the reading of the instrument, common to all registering meters, is confined in the Bastian meter to a simple tubular form of receptacle for the electrolyte, firmly supported, and well protected by a metal case. The meters withstand shipment to distant parts of the world, with no loss from breakage.

In the consumption of electrical energy we find the electrolytic meter the more economical, for while the "drop" or loss of potential across its terminals is somewhat greater than the "drop" in the field coils of the motor meter, yet the greater "drop" occurs only when the current is being used, while in the commutator motor meter, the little current in the armature coils is silently running to waste all the time. This loss of energy in the armature circuit amounts to 2 lamp hours per day, and though not of any great importance in the larger installations, becomes of more serious consideration in the case of the small customer.

Coming to the question of error in registration due to the inherent difference in the types of the instruments, let us examine the matter



Electrolytic Meter.

more carefully. The electrolytic meter is essentially a current meter, *i.e.*, it records the amount of current that is passed through it. If the electrical potential or "pressure" of the circuit is raised, the current increases too, and the current meter will register this increased amount. When the potential is lowered the smaller current resulting will be likewise recorded.

On the other hand, in the watt-hour meter, the speed of rotation depends not only on the amount of current being used, but is also influenced by the potential of the circuit which governs the small current always flowing in the armature coils of the instrument; so that in this type of meter the changes of speed due only to the fluctuations of potential are slightly more marked than in the current meter, *i,e.*, it runs a little faster than the current meter when the potential is raised, and runs a little slower than the current meter when the potential is lowered.

If, however, the potential variations are not excessive, or if considerable fluctuations occur and the resulting average potential is approximately normal, then the difference in the readings of the two instruments becomes a negligible or a vanishing quantity.

Suppose, for example, the potential of a normal circuit of 115 volts is raised 2 volts, and kept at 117 volts for 1 month, then the current meter record will be somewhat less than 2 per cent. lower than it ought to be.

If the potential be maintained at 113 volts then the record of the current meter will be somewhat less than 2 per cent. more than it should be.

Thus we see that this error in the calibration of the current meter slightly favors the consumer when the potential is high, and slightly favors the producer when the potential is low.

If we compare this error in the current meter record with the losses of registration due to the use of a jewel and other delicate mechanism of the watt-hour commutator motor meter, it will even at the end of one month's use in the majority of cases be found to be the smaller of the two, and by the end of six months' service it will have sunk into comparative insignificance.

That in practice no appreciable effect is introduced by the ordinary changes in the potential is shown by the fact that in England and on the Continent, where more attention is paid to detail and economy than in this country, the current meter reading in watt-hour units is extensively employed and its use moreover is rapidly increasing.

It is then more especially in meeting the requirements of the small consumer, where a reliable meter is needed at once cheap to install and inexpensive to operate, that the chemical meter is so well adapted. For with a comparatively high first cost, a necessity for skilled inspection and a constant waste of energy in the watt-hour instrument, the expenses of efficient meter maintenance may easily be out of proportion to the income derived.

Electricity is being supplied and used under such a variety of conditions that in order to obtain the best results a little latitude would seem necessary in the use of instruments. While it would be very nice for the central station manager to use only one kind of meter for all kinds of service, experience hardly supports such judgment, and it is no longer considered the best practice to use the commutator type of motor meter on alternating circuits.

It will be admitted that the electrolytic type of meter as represented in its latest construction is, remarkably simple and free from sources of error, and that however perfect the commutator type of motor meter may seem; the actual results of service necessitate its skilled attention.

We may fairly conclude, then, that both types of meters, differing radically in construction and operation as they do, have their own proper field of usefulness and service. And that under such conditions both may be depended upon to give good commercial results.

Coal in Nevada.

The *Journal of the Franklin Institute* notes that on account of the scarcity and high price of all fuel, the occurrence of coal, even of inferior quality, within the desert region of Nevada is a matter of great interest. At the north end of the Silver Peak Range, in Esmeralda county, just south of the road between Silver Peak and Candelaria, coal beds occur in tertiary formations. These beds have been recently visited by Mr. J. E. Spurr, of the United States Geological Survey, who has described them in a paper published in Bulletin No. 225, which is entitled "Contributions to Economic Geology, 1903."

This coal is said to have been discovered by William Grozenger, of Candelaria, in 1893, and the seams are now continuously located. The chief seams are four in number and some of them extend for a distance of 3,000 or 4,000 feet in outcrops that trend in a northwesterly and southeasterly direction. Mr. Grozenger has classified the veins, counting from the top, as the first, second, third and fourth veins. The distance between the first and second veins perpendicularly is estimated by him to be 150 feet, between the second and third, 70 feet, and between the third and fourth, 130 feet. The uppermost vein, No. 1, seems to be relatively poor and small, and, as exposed in outcrop, of little value. Vein No. 2 is in coal shales and is several feet thick. The vein contains considerable slate parting or bone. Vein No. 3, which is also in the coal shale, is of better quality and thicker than No. 2. No. 4 shows 6 to 8 feet of coal of much better quality than the upper veins. Some of this coal has a brilliant lustre, while the coal of the other veins is dull in color. It is used as a forge coal by Mr. Grozenger and affords a coke. The coal contains a smaller per cent. of ash than that of the upper veins.

These prospects have been bonded several times. The chief prospecting has been on the upper veins, and the coal developed has been so light in nature and so full of ash that prospecting has been repeatedly abandoned. It seems, however, that the lowest vein has been somewhat neglected and possibly this may be found in the future to be available as fuel. The outcrop of this vein is limited and broken near the fault, and its underground extent must be great. Inasmuch as the beds underlying this seam are not exposed on account of the fault, it is not impossible that still other seams may occur beneath it.

The numerous mining enterprises which have been recently developed in this region, where there is no water power, little wood supply, and only expensive transportation, make even these coals, which are undoubtedly poor in quality, important. Since they all contain a large percentage of volatile matter, the gas in them might be separated and profitably used for fuel.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Frank D. Moses, owing to the pressing demands on his time in connection with general construction work, has handed in his resignation as Eastern representative of the Stacey Manufacturing Company.

Mr. J. Alexander Mayers has removed his headquarters from 44 Broad street, New York, to 56 Pine street. The location is an excellent one, and "Alex." knows quite well all the points of interest in the vicinity.

Mr. George A. Swayze, receiver for the Orange County (N. Y.) Gas and Electric Company, informs those concerned that a meeting of the creditors will be held at the office of Myer Nussbaum, in the city of New York, at 10 A.M. of January 26th. "When all accounts and demands for and against such corporation, and all the open and subsisting contracts and obligations shall be ascertained and adjusted as far as may be, and the amount of moneys and assets in the hands of the receiver declared, and to transact such other business as such meeting in such case made and provided under the Revised Statutes and the Code of Civil Procedure of the State of New York."

Colonel William R. Denny, formerly President of the Winchester (Va.) Gas Company, died in Nashville, Tenn., the morning of the 4th inst. Deceased was born in Stephen City, Va., February 4th, 1823, and in early youth became a resident of Winchester where he resided for perhaps 50 years, becoming prominent in all that was important in that city's best interests. Our informant adds that a notable incident in Colonel Denny's life was his participation in the celebrated trip in 1867 of Mark Twain and his friends, which journeying is now known to all the world in the register of the "Innocents Abroad."

IT is still in the air that an attempt will be made this winter in the New Jersey Legislature to pass a bill authorizing cities of the second class to manufacture and supply gas on public and private account.

"S. R. T.," is informed that the Syracuse (N. Y.) Lighting Company is paying at the rate of 2 per cent. per annum on its common stock.

THE Water and Light Board of Duluth, Minn., proposes to make important changes in connection with the gas supply.

MR. C. H. GIPHERS, recently elected Secretary of the Lansing (Mich.) Gas Light Company, succeeding Mr. L. E. Walker, has actively assumed the duties of that position.

THE Directors of the Equitable Gas Illuminating Company, of Philadelphia, have declared the regular semi-annual dividend of 3 per cent. on the preferred stock.

THE American Gas Saving and Heating Company, of Lowell, Mass., has been incorporated by Messrs. Jonathan Johnson, Charles F. Adams and John S. McKnight. It is capitalized in $15,000.

WE understand that the necessary preliminary steps for the merging of the plants and properties of the Pontiac (Mich.) Light Company, the Kalamazoo (Mich.) Gas Company and the Jackson (Mich.) Gas Company, have been taken. The capital stock of the combined interests has been fixed at $1,250,000.

A CORRESPONDENT in Minneapolis, Minn., writing under date of the 9th inst., inclosed the following: "Minneapolis will be better lighted and have longer service next year than ever before in its history. The Gas Committee of the Council has approved the bids of the General Electric Company for arc lights, of the Minneapolis Gas Company for gas, and the Patterson Street Lighting Company of Cleveland, O., for installing and maintaining incandesant gas lamps. All the arc lights will be put upon an all-night schedule, the old moonlight schedule being laid aside with the other memories of the ante-Metropolitan days of Minneapolis. The specifications call for an annual service of 150 hours longer than that of last year, and the annoyance caused by extinguished lights long before daylight will cease. The cost of the lamps remains the same as last year under the shorter schedule, $94 per lamp per year. All the 5,500 gas lights in the city will be equipped with the incandescent mantle, and the old-time open flame burner will also become a provincial memory of the streets of Minneapolis. The Patterson Company will maintain these 5,500 lights for $23.40 per light per year. There are 2,600 incandesent lights now in the city and 2,900 open flame lights. While the incandescent burns less gas, it costs much more to maintain and the increased cost to the city on gas lights for next year will amount to something over $14,000. But the greater efficiency of the incandescent justifies, in the opinion of the gas committee, the added expense. Gas will be furnished by the Minneapolis Gas Company at the present rate, 95 cents per 1,000 cubic feet. These contracts are all with the same Companies that are at present serving the city in the respective capacities."

IT looks that the project for a gas supply for Cameron, W. Va., will be pushed to completion. Of course, it will be of the natural order.

THE charter of the Charleston (S. C.) Gas Light Company has been extended for a period of 50 years.

WE understand that Mr. Frank M. Travis, Secretary and Treasurer of the New Haven, (Conn.) Gas Light Company and associates have purchased a controlling interest in the Winsted (Conn.) Gas Light Company. It is also thought that Mr. Travis will assume the active management of the Winsted concern.

THE gas supply of Elmira, N. Y., has been restored to its normal condition.

MR. EDWARD WELSH has been appointed to a responsible position on the office force of the Mahoning Gas Fuel Company, of Youngstown, O.

THE Columbia (S. C.) Gas Company's plant is being put in shape to meet the increasing demands that are causing its owners to take on belief in its value.

THE annual stockholders' meeting of the Ohio and Indiana Consolidated Natural and Illuminating Gas Company will be held the 4th prox.

RECENT word from Memphis, Tenn., is to this effect: "The Memphis Consolidated Gas and Electric Company is engaged in returning to consumers of electricity the deposits of $7.50 heretofore required to be left with that corporation to guarantee the return of the meters and lamps put into houses. Reduction in the prices of electricity and illuminating gas are announced to be made July 1, 1905. Consumers of electricity were required to deposit $7.50 to cover the expense of making the connection, and that deposit is still required and will not be returned. Later on the Company required the deposit of another $7.50 to guarantee the return of the lamps and meters by the consumers and to insure the payment of the light bills. It is the latter deposit that is being refunded by the corporation. Officials of the Company take the position that the Company desires to be upon the same footing or standing as merchants, and if it sees fit to credit consumers it will do so without requiring the deposit to secure the payment of bills and the return of meters and lamps. It is however, returning the deposits in its own way, and announces that if a citizen has a deposit with the Company, a letter is written to such citizen informing him that by applying at the office the deposit will be refunded, and that unless such letter is received no citizen need apply for the deposit. After July 1, 1905, officials of the Company announce that the price of electricity will drop from 11 cents net per kilowatt hour to 10 cents, and that the price of illuminating gas will be $1 per 1,000 cubic feet. It claims further that the prices of gas and electricity have dropped within the last five years almost 100 per cent."

MR. HENRY F. COGGSHALL, whose life has in a mercantile way been bound up in the gas and electric interests of Fitchburg, Mass., for close to half a century, was remarried on the 6th inst. The present Mrs. Coggshall was a Miss C. L. Wilbur. The ceremony was performed in Wilkes Barre, Pa. The veteran is 81. Good luck to him and to his partner.

THE plant at Penn Argyl, Pa., has been completed, and Mr. Sutherland is ready to have the work inspected at any time.

THE *Iron Age*, noting the "Liability of Employers," says that the President's recommendation "that the Congress appoint a commission to make a comprehensive study of employers' liability with the view of extending the provisions of a great and constitutional law to all employments within the scope of Federal power" can hardly fail to meet with the approval of employers of labor everywhere in the country. The employers' liability acts of most and probably of all the States of the Union have worked out very unsatisfactory results. They are exceedingly complicated, with widely varying precedents. They permit legal technicalities to govern many decisions, regardless of moral justice. Jury awards are often excessive, there being little restraint to results obtained by appeals to the sympathy of jurors. There is absolutely no means of foretelling the outcome of a trial of such causes, and consequently the element of gambling exists to an almost alarming extent, for lawyers of a certain class, oftentimes very bright men, have been led to accept and even to solicit practice on a contingent basis, the lawyer to receive a substantial percentage of the award if the plaintiff wins, or to give his services free if the decision be an adverse one. Such practitioners go so far as to advance the necessary funds for the payment of court fees, expecting to be reimbursed out of the jury's award of damages. Manufacturers everywhere suffer from this abuse as well as from the other general weaknesses of employers' liability acts as they exist to-day. Much antagonism between employer and employee has naturally arisen from these conditions. The Federal Government has not the power to make laws governing employers' liability in the States excepting under certain conditions. An act with a scope as broad as that of the bankruptcy act would probably not be constitutional. But the influence of a national act "within the scope of the Federal power" would be very great if it was wisely and simply framed, and so, too, would be the influence of a report of a commission made up of able men, properly equipped for the task, who would go right into the question carefully and with due regard for the rights of all parties that would be affected. Very interesting experiments with workmen's compensation acts have been made in Great Britain and on the Continent, and the commisson might very well look deeply into a system which defines with some degree of exactness the financial limits of an employer's liability. A law might be framed that would be nearer perfection than anything that exists to-day in that it would include only that which practice has demonstrated to be the best.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

MONDAY, DECEMBER 19, 1904.

The Market for Gas Securities.

Hearst and Company seem to have had sufficient influence in the local gas share market to accomplish in a way that which was done in the general share market by Mister Lawson. The "peggers" put Consolidated gas close to the 200 mark, although our belief is that the short account sellers were permitted to take something like a profit. The suit on city account can only result in one way. The contracts were legally made, the city is solvent, and the city will pay. Meanwhile it might do us all good to remember that a commercial company that can wait years or so for its payments is in good financial standing. The closing for Consolidated to-day (Friday) was 201½ to 202. Gas bonds continue strong.

In outside gas securities there is not much to report. Nominally, Brooklyn Union is at the ridiculously low figures of 208 to 213. Baltimore is a trifle weaker, without cause or reason therefor. Peoples, of Chicago, is better than steady, and Washington top notch price is 315 to 318.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 19.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,127,000	100	201½	202
Central Union, Bonds, 5's	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	112	113½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,500	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	20	214
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	—	—
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	5¾
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	10	10 8½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,662,750	100	88¾	89¼
Preferred	3,026,500	100	107½	109
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	83	84
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	981,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104¼	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 6's	2,550,000	..	106½	108
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	90	..
Bonds	10,000,000	1,000	108¼	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,800,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	106¾	106⅞
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal	15,800,000	100	58½	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	94	96
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	500,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	.
Washington, D. C	2,500,000	20	315	317½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600,000	50	230	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 14, 1904.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 14th, 1905, to stockholders of record at the close of business, Dec. 31, 1904. Checks will be mailed.

1541-4 LEWIS LILLIE, Treasurer.

Situation Wanted.

A young man experienced in the various branches of the gas business, wishes to become connected with a coal or water gas company that will appreciate the services of a hustler. Applicant is willing to accept a subordinate position, if same can be secured by December 25th.
Address, "M. N. J.,"
1541-1 Care this Journal.

Position Wanted

By a young man having 10 years' experience as a hustler for new business in a gas works. Also understands estimating on house piping, electric wiring, etc. Best of references.
1541-1 Address, "HUSTLER," care this Journal.

WANTED,

Position with a Gas, Electric or Construction Company,

Where there is chance for advancement, by young man with technical education and some experience in the manufacture and distribution of gas and electricity. Can furnish good references. Address, "TECHNOLOGY,"
1540-2 Care this Journal.

Position Wanted.

Competent business man having 15 years' experience in gas, electric and street railway work, desires a position as manager of lighting department of large gas or gas and electric company. First-class references.
1541-2 Address, "WIRELESS," care this Journal.

FOR SALE,

One Second-hand Station Meter,

Four feet by 4 feet, with 6-inch opening; one 6 feet by 6 feet, with 8-inch opening. Address,
THE SARATOGA GAS, ELECTRIC LIGHT AND POWER COMPANY,
1541-tf SARATOGA SPRINGS, N. Y.

FOR SALE.

One 75,000-Gallon Oil Tank.
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Two 90 by 48-inch Boilers, 98 1½-inch tubes.
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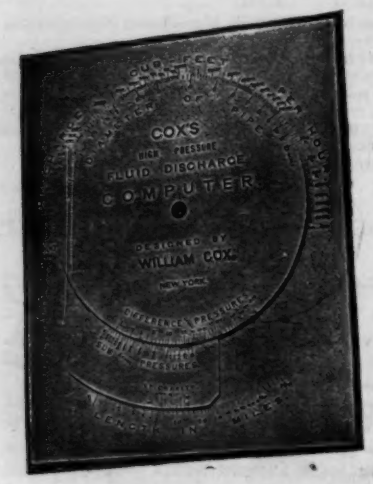

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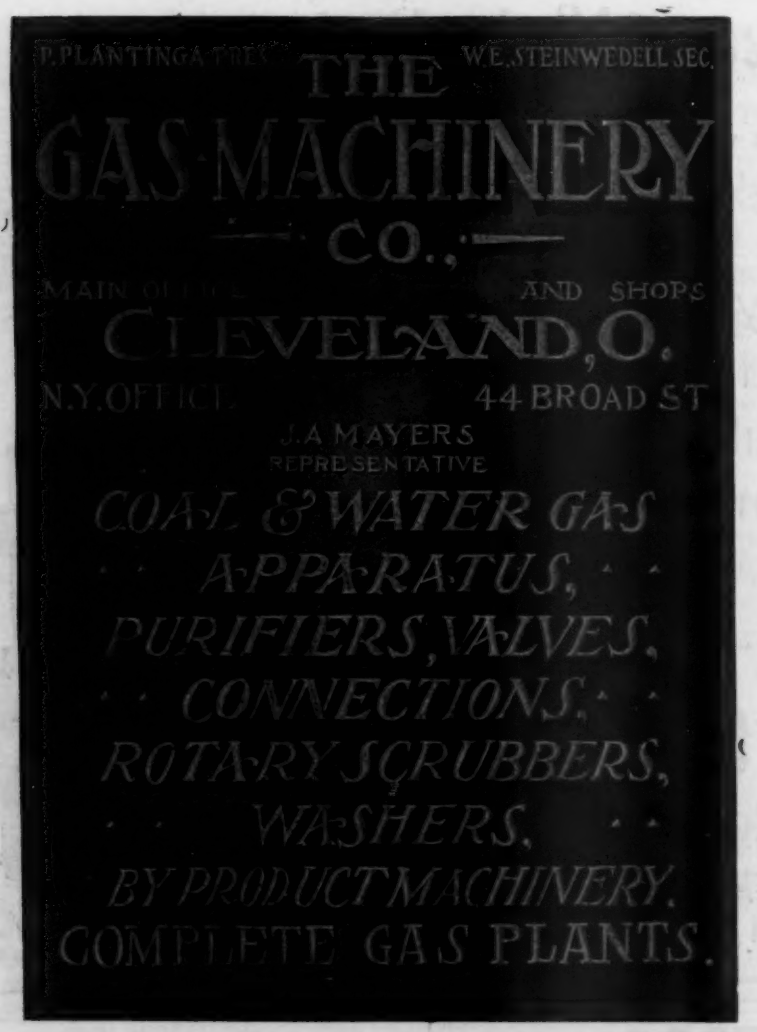

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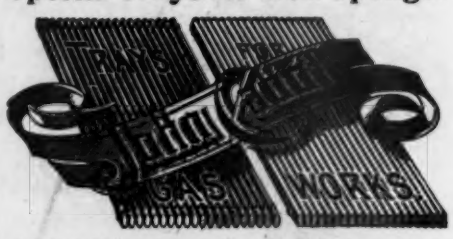

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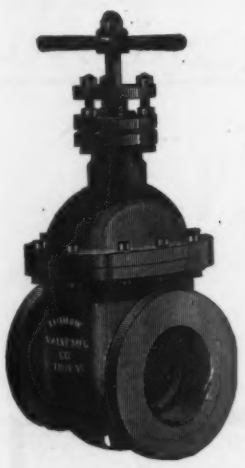

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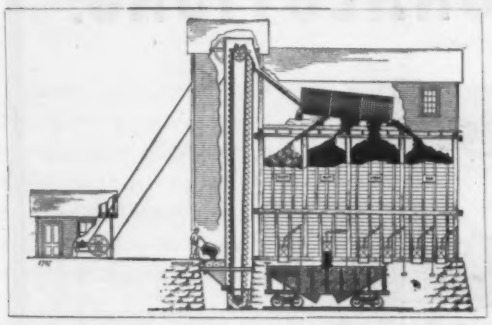

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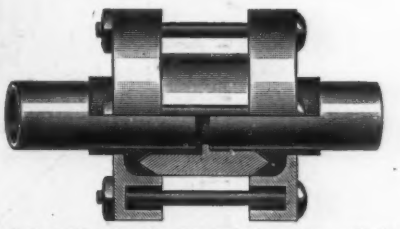

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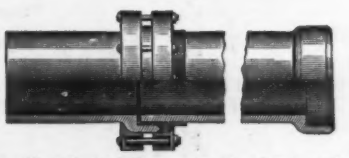

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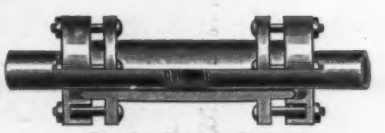

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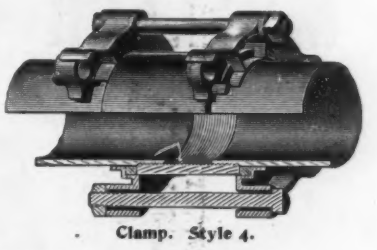

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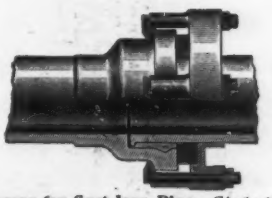

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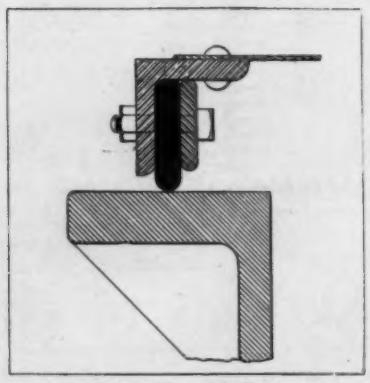

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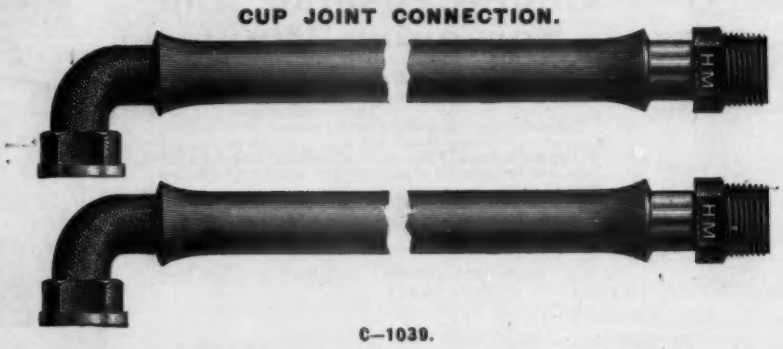

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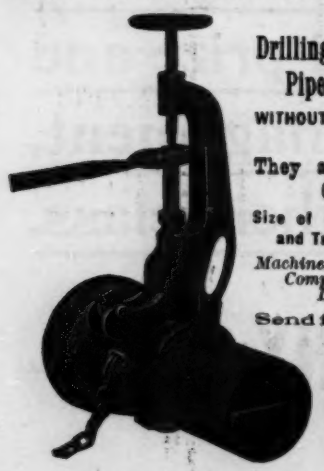

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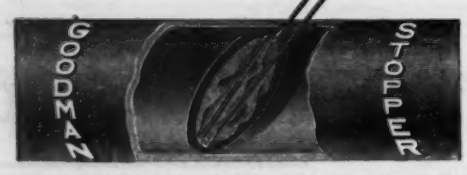

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FOR WIDE BELTS.
The positions of the rolls conform to a natural and uniform curve of the belt.

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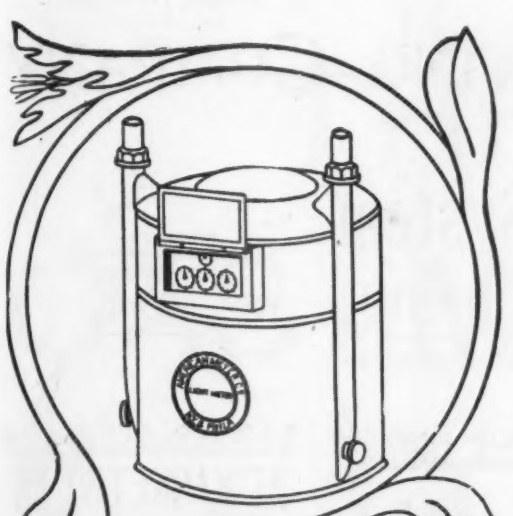
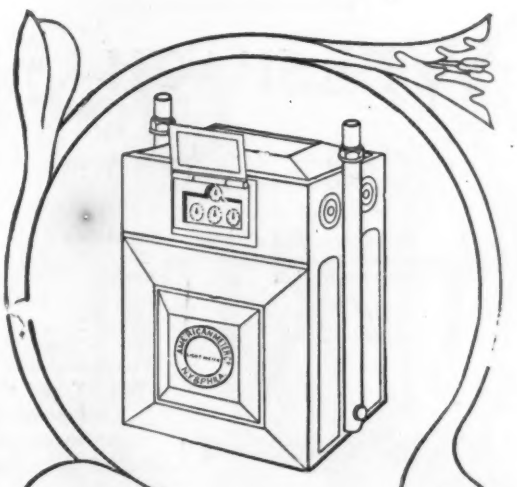
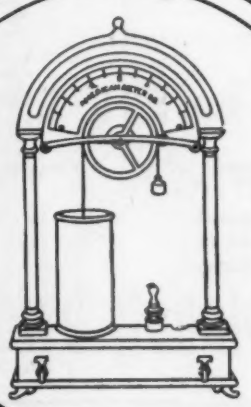
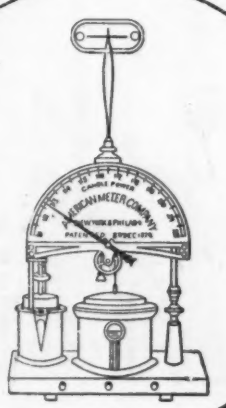
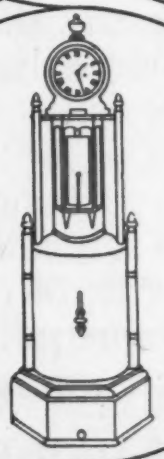
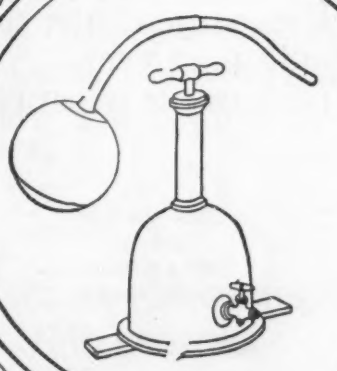


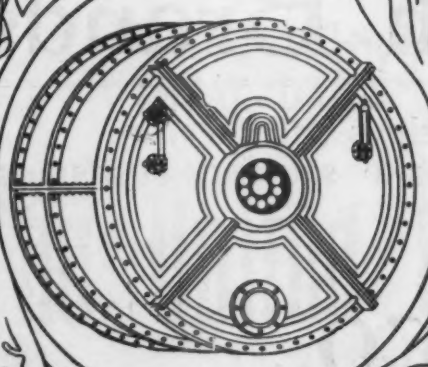


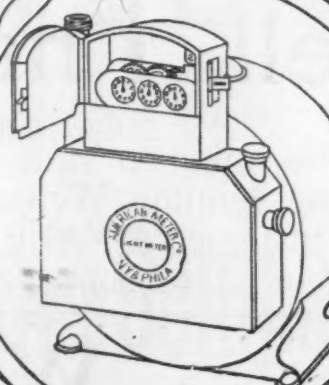












PUBLIC LIGHTING TABLE.

JANUARY, 1905

Day of Week.	Table No. 1. FOLLOWING THE MOON.			Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING.	
	Date.	Light.	Extinguish	Light.	Extinguish.
				P.M.	A.M.
Sun.	1	5.20 PM	5.00 AM	4.30	6.30
Mon.	2	5.20	6.20	4.30	6.30
Tue.	3	5.20	6.20	4.30	6.30
Wed.	4	5.20	6.20	4.30	6.30
Thu.	5	5.20 NM	6.20	4.30	6.30
Fri.	6	5.20	6.20	4.30	6.30
Sat.	7	5.20	6.20	4.30	6.30
Sun.	8	5.20	6.20	4.40	6.30
Mon.	9	5.20	6.20	4.40	6.30
Tue.	10	8.50	6.20	4.40	6.30
Wed.	11	9.50	6.20	4.40	6.30
Thu.	12	10.40	6.20	4.40	6.30
Fri.	13	11.40 FQ	6.20	4.40	6.30
Sat.	14	12.40 AM	6.20	4.40	6.30
Sun	15	1 40	6.20	4.50	6.25
Mon.	16	2.30	6.20	4.50	6.25
Tue.	17	3.30	6.20	4.50	6.25
Wed.	18	4.30	6.20	4.50	6.25
Thu.	19	No L.	No L.	4.50	6.25
Fri.	20	No L. FM	No L.	4.50	6.25
Sat.	21	No L.	No L.	4.50	6.25
Sun.	22	5.40 PM	8.00 PM	5.00	6.25
Mon.	23	5.40	9.10	5.00	6.25
Tue.	24	5.40	10.20	5.00	6.25
Wed.	25	5.40	11.30	5.00	6.25
Thu.	26	5.40	12.40 AM	5.00	6.25
Fri.	27	5.40 LQ	1.50	5 00	6.25
Sat.	28	5.40	2.50	5.00	6.25
Sun.	29	5.50	3.50	5.05	6.15
Mon.	30	5.50	4.50	5.05	6.15
Tue.	31	5.50	6.10	5.05	6 15

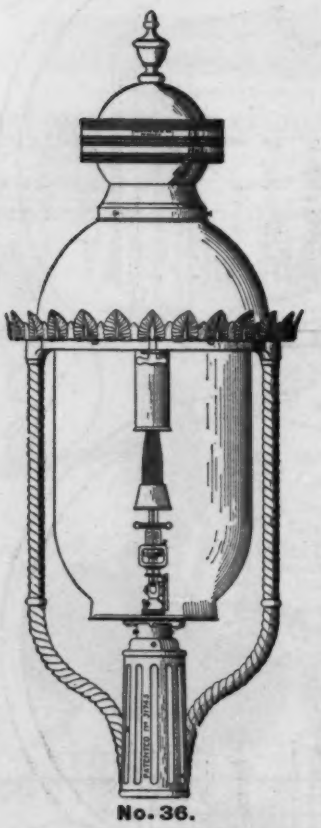
TOTAL HOURS LIGHTING DURING 1905.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	240.50	January	423.20
February	192.20	February	355.25
March	207.00	March	355.35
April	175.10	April	298.50
May	161.00	May	264.50
June	139.50	June	234.25
July	149.00	July	243.45
August	161.50	August	280.25
September	173.00	September	321.15
October	205.00	October	374.30
November	211.00	November	401.40
December	229.00	December	433.45
Total, yr.	2245.00	Total, yr.	3987.45

NEW YORK, 97 Liberty Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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No. 38.

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IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

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For the Period Ending July 31st, 1904, has been Awarded Contracts in the Following Places for

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Bangor, Pa.	Westchester, N. Y. (3d contract).
Woonsocket, R. I. (2d contract).	Bridgeport, Conn. (2d contract).
Brooklyn, N. Y. (4th contract).	St. Paul, Minn. (2d contract).
Cincinnati, O. (2d contract).	Harrisburg, Pa.
Scranton, Pa. (3d contract).	Pelham, N. Y.
New York City (14th contract).	Reading, Pa.
New Haven Conn. (2d contract).	Springfield, Mass. (2d contract).
Watertown, N. Y.	Lynn, Mass. (5th contract).

TOTAL SETS, 1904, ... 35
TOTAL DAILY CAPACITY, 1904, . . 50,400,000 cubic feet.
TOTAL SETS TO DATE, ... 543
TOTAL DAILY CAPACITY, ... 413,180,000 cubic feet.

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Established 1850. Incorporated 1890.
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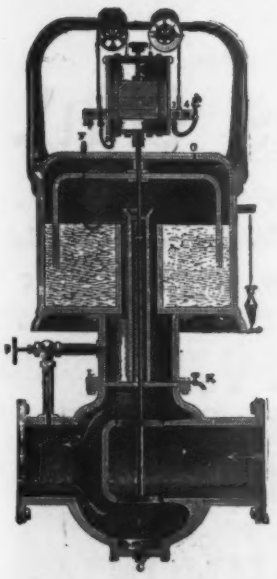

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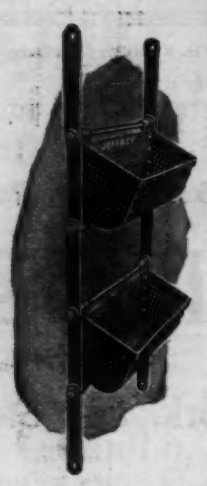

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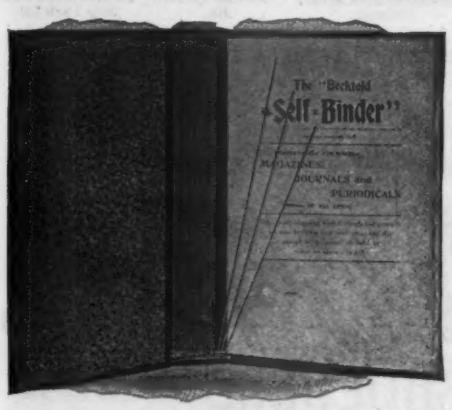

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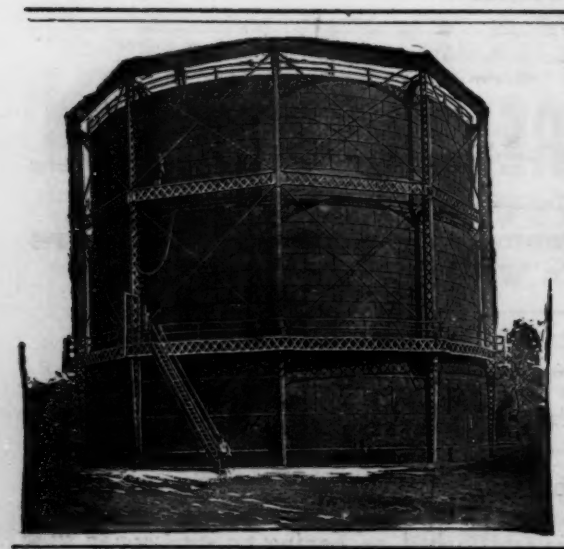

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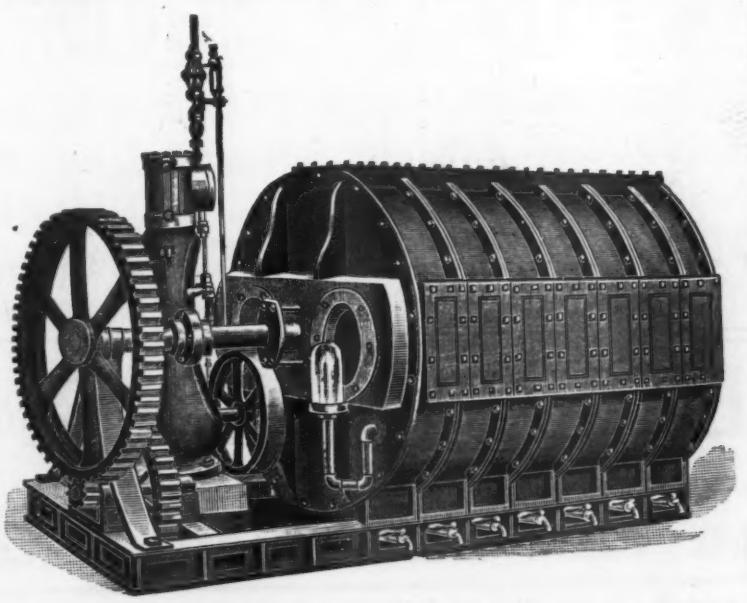

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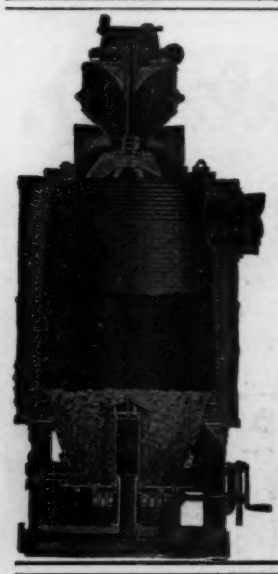

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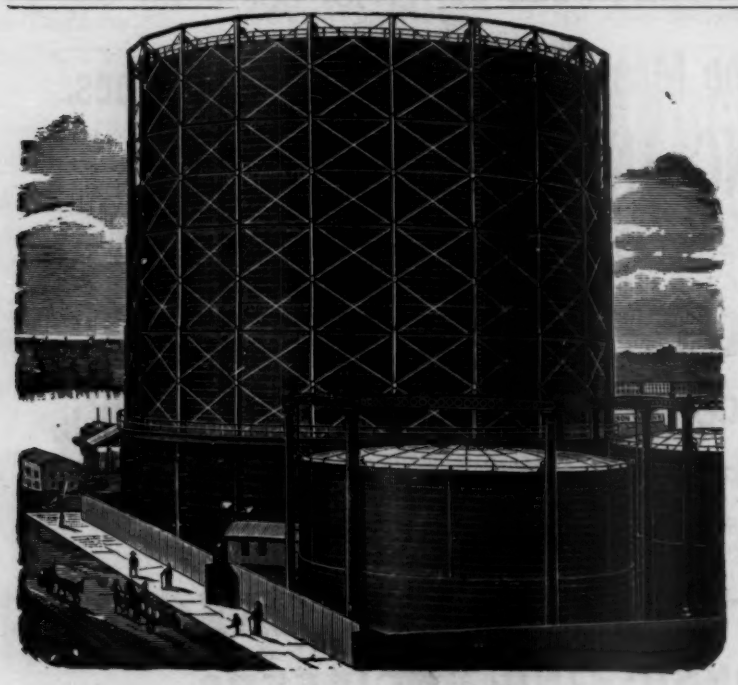

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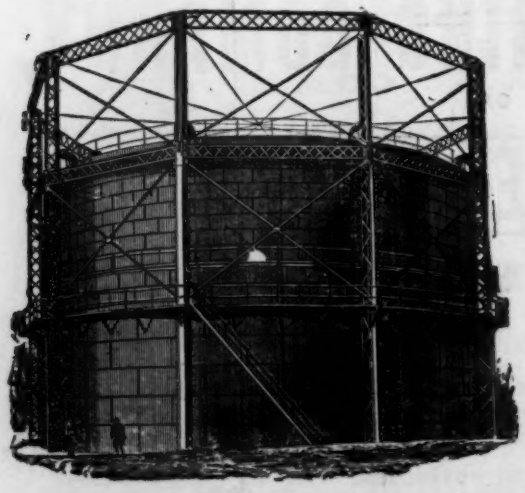

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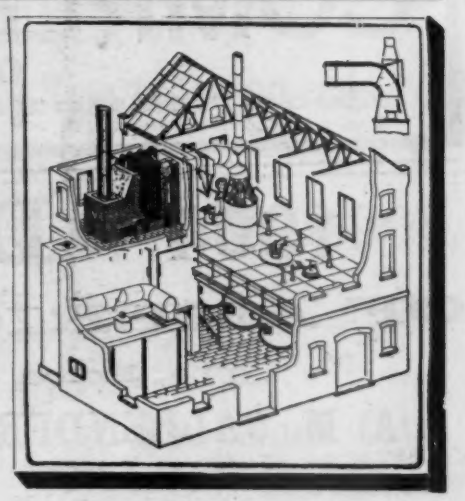

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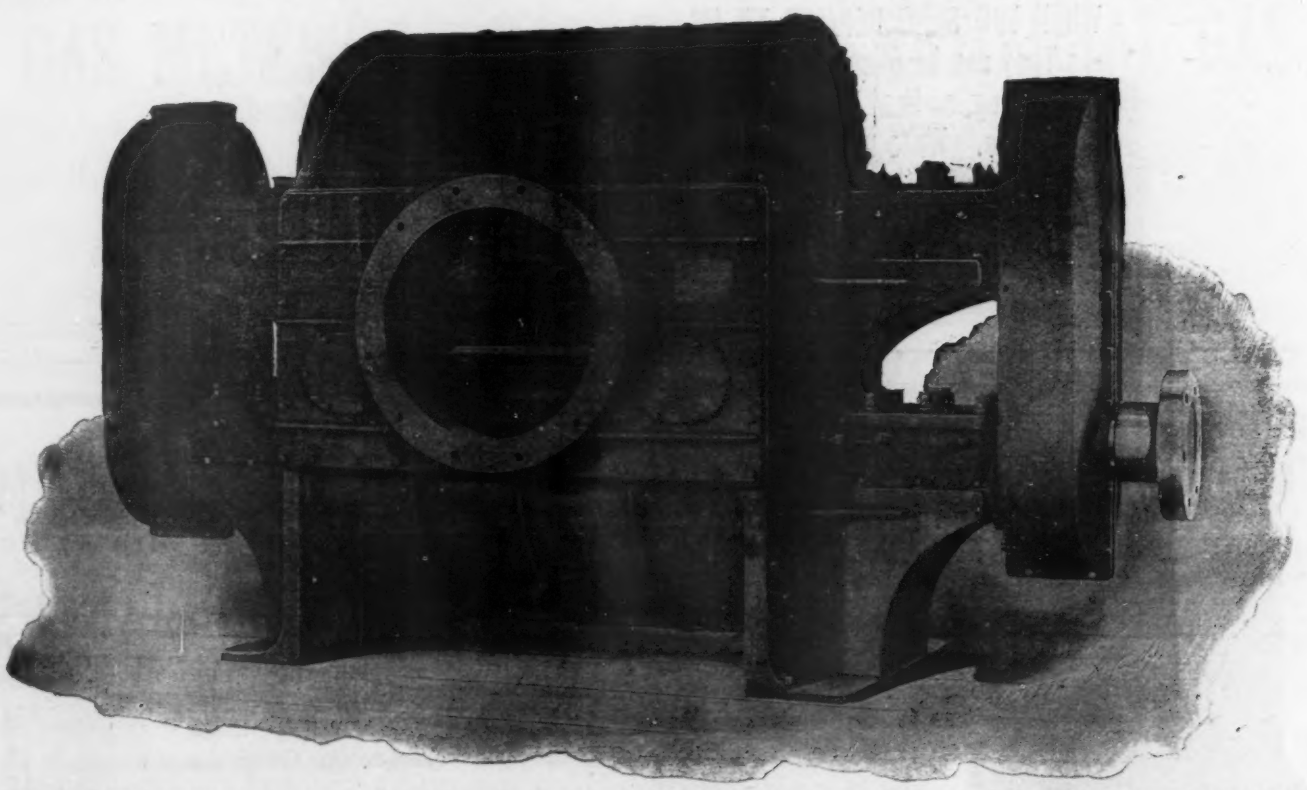

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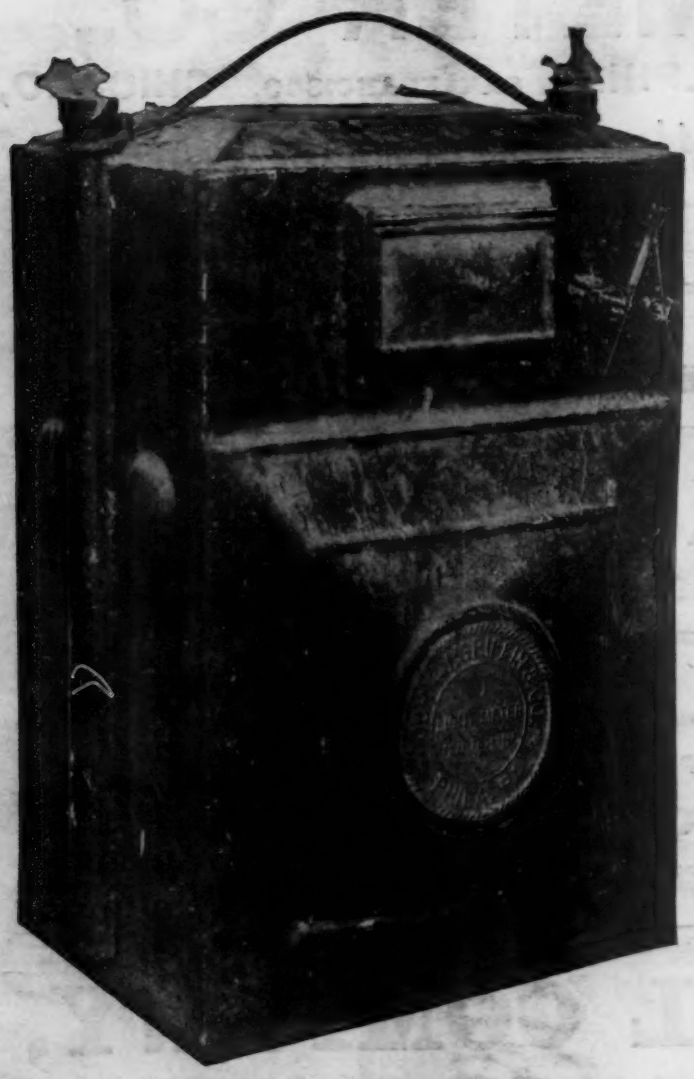

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